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Late Quaternary Studies in Beringia and Beyond, 1950–1993: An Annotated Bibliography

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THE PROVINCIAL MUSEUM OF ALBERTA

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COMMUNITY DEVELOPMENT

LATE QUATERNARY STUDIES IN BERINGIA AND BEYOND, 1950-1993: AN ANNOTATED BIBLIOGRAPHY

by

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ABSTRACT

This annotated bibliography is designed as a research tool for Quaternarists interested in Beringia and adjacent areas. Beringia comprises the northern hemisphere region centred on Siberia and Alaska-Yukon and bounded by the Lena River to the west and the Mackenzie River to the east. Other areas covered in this volume include western Siberia between the Lena and Yenisey Rivers, northeastern China, northern Korea and Japan. It also covers the portion of the northern Pacific Ocean and offshore continental shelf that would have been terrestrial during the Late Pleistocene full-glacial. The bibliography includes references to research papers, books, monographs, short notes, theses, conference abstracts, conference reports, popular articles, and commentaries, published between 1950-1993. The citations deal with surficial geology, glacial history, climate history, palaeontology, archaeology, and palaeoenvironments in Beringia between about 50,000 and 10,000 yr BP. References include abstracts, where available. The bibliography comprises 1001 citations, annotated by topic, geographic area and library location, and is accompanied by a comprehensive index. This bibliography has been compiled as part of the Provincial Museum of Alberta's *Bridge of the Black Dragon Project*.

ACKNOWLEDGEMENTS

This project has been completed for the *Bridge of the Black Dragon Project* of the Provincial Museum of Alberta. Financial support for this part of the project was provided by through the Museums' Assistance Programme (MAP) of Heritage Canada, for which we are grateful. We thank Dr. Jack Ives (Assistant Director, Archaeology and Ethnology) and Dr. Bruce McGillivray (Assistant Director, Collections and Curatorial) of the Provincial Museum of Alberta for their successful feasibility study application to the Museums' Assistance Programme, and Dr. Philip Stepney (Director, Provincial Museum of Alberta) for his support of the project. We also thank our colleagues of the Heilongjiang Provincial Relics Management Committee, and especially those of the Archaeological Institute of Heilongjiang, for their continued collaborative efforts on our joint project with Alberta's sister province in China.

The Friends of the Provincial Museum Society provided financial assistance for printing this bibliography. We thank them for their generosity.

We also take this opportunity to thank the many people who have helped us to assemble this bibliography during the past year. In particular we thank: George Chalut for lending us copies of many journals and other publications from his own collection; Dr. Harold N. Bryant (Curator of Mammalogy, Provincial Museum of Alberta) and Dr. James A. Burns (Curator of Quaternary Vertebrate Paleontology, Provincial Museum of Alberta) for clarifying the complexities of faunal nomenclature; Justin T. Chen (Department of East Asian Studies, University of Alberta) for advice on the format for Chinese names; Wendy Johnson (Cartographer, Archaeological Survey, Provincial Museum of Alberta) for drafting the maps; Joseph F. Kennedy (Graphic Designer) for suggestions on design and for preparation of the cover; Dr. Yves Beaudoin (Programmer/Analyst, Geology Department, University of Alberta) for technical assistance; and Zerina Johanson for drawing our attention to some references at the beginning of the project. We also express our gratitude to many colleagues at the Provincial Museum and other institutions who responded to requests for information by providing copies of publications.

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INTRODUCTION AND ORGANIZATION OF THE BIBLIOGRAPHY

BACKGROUND TO THE PROJECT

This bibliography was assembled as part of background research for the Provincial Museum of Alberta's *Bridge of the Black Dragon Project*. This project focusses on the Late Pleistocene landscapes and archaeology of Heilongjiang and is being undertaken in co-operation with colleagues from the Heilongjiang Archaeological Institute, Harbin, China.

From palaeoanthropological evidence, Northeast Asia, a region which includes Heilongjiang, has long been considered a likely source area for the human populations that occupied North America (Turner 1983, 1988). Based on the available archaeological evidence, the timing for initial occupation of North America has been hypothesized as the Late Pleistocene (Fladmark 1983) and specifically the Mid- or Late Wisconsinan intervals (i.e., between about 65,000 - 10,000 yr BP). During the Mid-Wisconsinan or Boutellier Interval, North America and Northeast Asia were essentially ice-free. During the Late Wisconsinan or Duvanny Yar Interval, much of Canada and the northern United States was inundated by ice, but large areas of Alaska and Yukon remained ice-free and occupied by vegetation and a varied assemblage of large mammals (Hopkins *et al.* 1982). Lowered sea-levels exposed large areas of the continental shelf fringing the north Pacific and southern Arctic oceans, which were then available for colonization by plants, animals, and possibly humans (Figure 1). Much of the seaway now separating Northeast Asia and North America (the Bering-Chukchi Platform) was subaerial and formed the Bering Land Bridge. Until separated by rising sea-levels at the close of the last glaciation, perhaps about 14,000 yr BP, there was a direct land connection, lasting several millennia, between Northeast Asia and North America (Hopkins *et al.* 1982). Thus, there was no major ocean or ice barrier preventing movement of people, animals, and plants across this region.

Northeast China, including Heilongjiang, may have been among the source areas for people occupying the Bering Land Bridge, and ultimately moving into North America, in the Late Pleistocene. China as a whole has a long archaeological and palaeontological record. Recent discoveries in Heilongjiang suggest human presence there during the Late Pleistocene, and some sites may date prior to the last glaciation (You *et al.* 1986). Abundant remains of Late Pleistocene megafauna, including mammoth and woolly rhinoceros, are also found in northeast China (Liu and Li 1984). Heilongjiang, although it likely did not experience widespread glaciation (Derbyshire 1987), probably suffered severe climatic conditions during the Late Wisconsinan. If people occupied this region, and areas further north, at this time, they must have developed strategies (clothing, shelter, and hunting techniques etc.) to enable them to cope with these harsh conditions.

Hence, a particular research concern, ancillary to the *Bridge of the Black Dragon Project*, is the possibility of human occupation and exploitation of northern and periglacial landscapes in Beringia prior to and during the last major glacial interval. The principal objective for this bibliography, therefore, was to compile references relevant to an assessment of Late Pleistocene Beringian landscapes and their archaeology and human history, including plant and animal resources, geomorphology, climatic conditions, and sea level fluctuations.

SCOPE OF THE BIBLIOGRAPHY

The major decisions involved in assembling this bibliography were related to setting limits on the search. The area considered, the temporal framework, and the topics included all required strict definition and limitation if the amount of material acquired was to remain manageable. However, an effort was

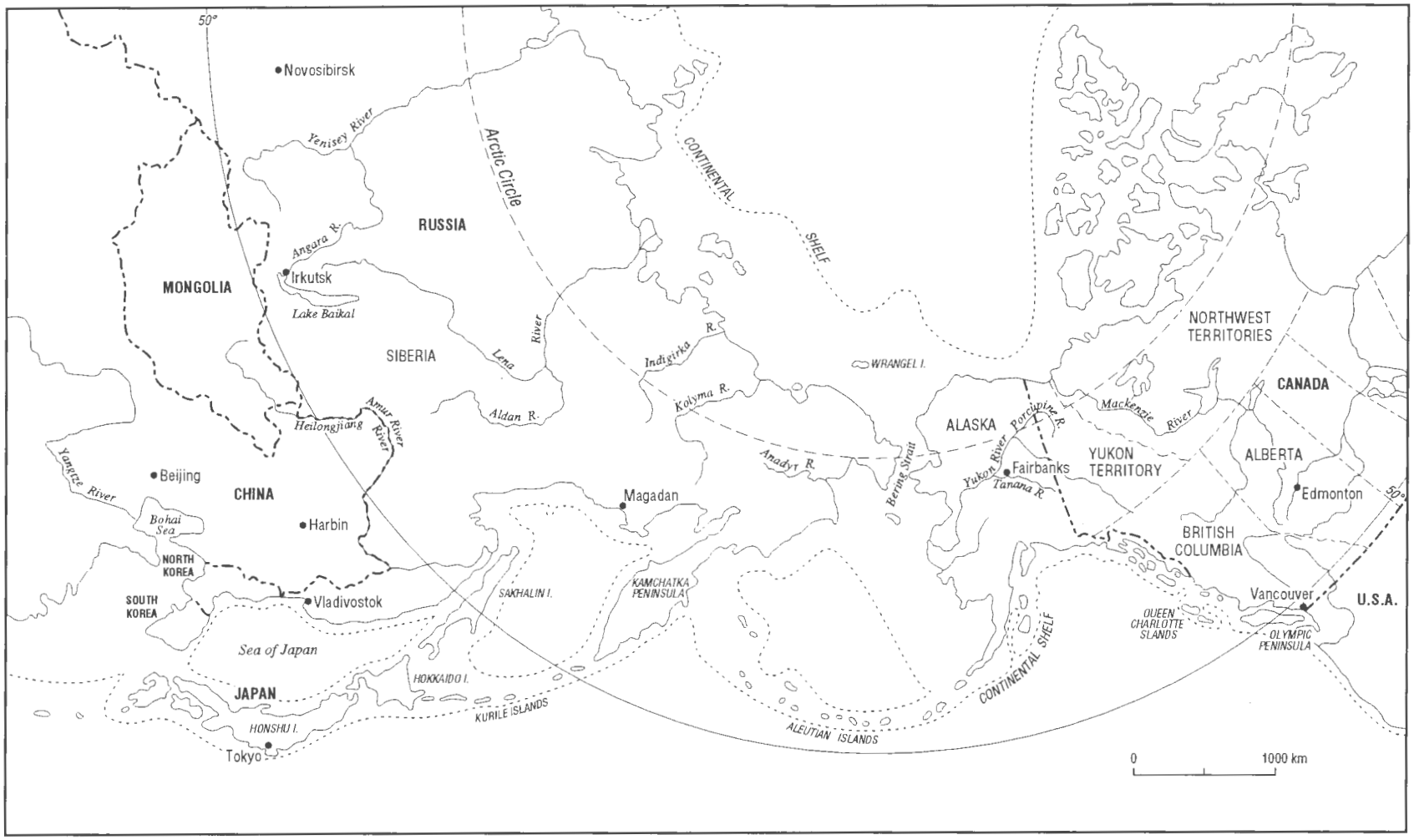

Figure 1: The region of Beringia as defined in this project.

made to select meaningful temporal and spatial limits and, within these, to cover a representative selection of the literature. We attempted to include some recent review papers and some "classic", i.e., oft-cited, papers in order to give an over-view of the subject development in each area covered. Our intention was to produce a source-book that could be used as a starting-point for research by anyone interested in Late Quaternary Beringia.

1. Areal coverage

The area covered by this bibliography includes Beringia in a broad sense. We defined Beringia as the region of northeast Asia and North America bounded by the Lena River to the west and the Mackenzie River to the east (Figure 1). This volume also includes material from western Siberia, northeast China, parts of adjacent north Korea, and Japan, particularly Hokkaido. It also covers the offshore islands and continental shelf fringing Beringia around the margin of the northeastern Pacific Ocean as far south as the Olympic Peninsula, Washington.

2. Temporal coverage

One main focus of this bibliography is the peopling of the New World, and therefore the temporal limits of the search were designed to encompass the time frame when this process is most likely to have occurred, the Late Pleistocene. The temporal limits were thus set at about 50,000 to 10,000 years BP. This includes the close of the Mid-Wisconsinan or Boutellier non-glacial interval, and the Late Wisconsinan or Duvanny Yar glaciation and deglaciation.

The literature search was confined to publications produced since 1950, i.e., since the advent of radiocarbon dating. A few references prior to this date have been included when they were deemed particularly significant or have been widely cited.

3. Topical coverage

A wide range of relevant topics were considered for inclusion in this bibliography. The main topics covered are Late Quaternary geology, palaeontology, palaeoenvironments, and archaeology. A few citations dealing with modern biogeography have been included, particularly for taxa whose modern distributions or genetics may reveal details of their Late Pleistocene migrations. Clearly, any one of these topics could furnish enough material for a volume of this size on its own.

SEARCH METHODOLOGY

The material included in this bibliography consists mainly of research papers, review articles, short notes, and conference abstracts, with some popular articles and commentaries. At the outset of this project, a selection of papers was available from personal collections. Bibliographies in these papers were searched for relevant publications. These were then obtained and searched in their turn. Most of the material in this bibliography was acquired by this means. The material included in this volume was mainly found through searching the University of Alberta Library holdings. Other material was acquired from various alternate sources, principally through loans from private collections. Abstracting journals were not found particularly useful in this search, because the areal or temporal definitions were rarely stringent enough to decide if the papers cited therein were relevant. On-line search services available at the University of Alberta were used to a limited extent. Some particularly relevant journals (Arctic Anthropology, Canadian Journal of Earth Sciences, Quaternary Research) were searched systematically. The main journals and serials consulted, with their library call numbers, are listed on the following pages:

Journal	Library	Call Number
Acta Zoologica Fennica	POLAR	05 A188
American Anthropologist	PMC	GN 1 A51
American Antiquity	PMC	CC 1 A6
American Journal of Physical Anthropology	PMC	GN 1 A49
The American Midland Naturalist	SCI	QH 1 A51
American Museum Novitates	SCI	QH 1 A512
American Scientist	SCI	Q 1 A51
Annales Zoologici Fennici	SCI	QL 1 A53
Annual Review of Anthropology	HSS	GN 1 A618
Anthropologica	PMC	GN 1 A62
Anthropological Papers of the University of Alaska	HSS	F 906 A32
Arctic	SCI	G 600 A67
Arctic and Alpine Research	SCI	G 1 A68
Arctic Anthropology	PMC	GN 1 A68
The Arctic Circular	SCI	G 600 A674
Arctic Research of the United States	SCI	G 593 A675
Asian Perspectives	PMC	DS 514 A83
Biological Reviews	SCI	QH 301 C17
Boreas	SCI	QE 696 B73
The Bryologist	SCI	QK 534 B91
Bulletin of the Museum of Comparative Zoology	SCI	QL 1 H33
The Bulletin of Zoological Nomenclature	SCI	QL 353 I6
Canadian Geographical Journal	PMC	G 1 C21
Canadian Journal of Anthropology	PMC	GN 1 C22
Canadian Journal of Archaeology	PMC	FC 65 C1152
Canadian Journal of Botany	SCI	QK 1 C21
Canadian Journal of Earth Sciences	SCI	QE 1 C212
Canadian Journal of Forest Research	SCI	SD 145 C23
Canadian Journal of Zoology	SCI	QL 1 C21
Catena	SCI	GB 400 C35
The China Geographer	HSS	GB 316 C53
China Reconstructs	PMC	DS 701 C532
Current Anthropology	PMC	GN 1 C97
Davidson Journal of Anthropology	PMC	GN 1 D25
Ecological Monographs	SCI	QH 540 E28
Ecology	SCI	QH 540 E19
Ethnos	PMC	GN 1 E845
Evolution	SCI	QH 301 E93
The Geographical Magazine	PMC	G 1 G346
Géographie physique et Quaternaire	SCI	G 1 R452
GeoJournal	SCI	QE 1 G295
Geological Society of America Bulletin	SCI	QE 1 G341
Geology	SCI	QE 1 G3455
Geophysical Journal of the Royal Astronomical Society	PHYSC	QC 801 G345
Geophysical Research Letters	PHYSC	QC 801 G347

Journal	Library	Call Number
Geos	SCI	TN 1 G35
Geotimes	SCI	QE 1 G356
Human Biology	SCI	GN 1 H918
Inter-Nord	HSS	HC 10 I625
International Geology Review	SCI	QE 1 I612
Japanese Journal of Geology and Geography	SCI	QE 1 J35
Journal of Archaeological Science	PMC	CC 1 J86
Journal of Biogeography	SCI	G 1 J855
Journal of Mammalogy	SCI	QL 700 J86
Journal of Paleontology	SCI	QE 701 J86
Journal of the Faculty of Science, Hokkaido University. Series IV: Geology and Mineralogy	SCI	QE 1 H72
Journal of World Prehistory	PMC	GN 700 J88
Korea Journal	GOV DOC	KO1 NCU K54
Man	PMC	GN 1 M25
Marine Geology	SCI	QE 1 M33
National Geographic	PMC	G 1 N277
National Geographic Research	SCI	QH 1 N27
Natural History	SCI	QH 1 N28
Nature	SCI	Q 1 N28
The New Phytologist	SCI	QK 1 N53
Norsk Geologisk Tidsskrift	SCI	QE 1 N86
North/Nord	GOV DOC	CA1 R 71-10
The Palaeobotanist	SCI	QE 901 P153
Palaeogeography, Palaeoclimatology, Palaeoecology	SCI	QE 500 P15
Plains Anthropologist	PMC	E 51 P69
Polar Record	SCI	G 575 P75
Pollen et Spores	SCI	QK 1 P77
Progress in Physical Geography	SCI	G 1 P96
Quaestiones Entomologicae	SCI	QL 461 Q2
The Quarterly Review of Biology	SCI	QH 301 Q1
Quaternaria	SCI	QE 741 Q13
Quaternary International	SCI	QE 696 Q229
Quaternary Research	SCI	QE 696 Q24
Quaternary Science Reviews	SCI	QE 696 Q245
Review of Palaeobotany and Palynology	SCI	QE 901 R45
Science	SCI	Q 1 S41
Sciencia Sinica	SCI	Q 1 S418
Sciencia Sinica (Series B)	SCI	Q 1 S4183
Scientific American	SCI	Q 1 S417
Systematic Zoology	SCI	QL 1 S99
Vegetatio	SCI	QK 1 V42
Vertebrata PalAsiatica/Ku chi ch'ui tung wu hsueh pao	SCI	QE 701 K95

Conference abstracts cited in this bibliography are from major national and international conferences such as AMQUA Biennial Meetings, INQUA Congresses, GAC Annual Meetings, and GSA Meetings. Abbreviations used in listing the conferences are as follows:

AMQUA - American Quaternary Association
CAG - Canadian Association of Geographers
CANQUA - Canadian Quaternary Association
GAC - Geological Association of Canada
GSA - Geological Society of America
INQUA - International Union for Quaternary Research
MAC - Mineralogical Association of Canada

Access to conference abstracts is often difficult. Although most conferences do produce a "Programme and Abstracts" volume, these are generally not obtainable from libraries. In many cases, abstracts can only be obtained from the authors or a conference participant who has retained a copy of the volume.

ORGANIZATION OF THE BIBLIOGRAPHY

The citations in this bibliography are organized hierarchically, first by geographic area, and then into subsections by topic. Thus the references are arranged into seven main sections; six sections are identified on the basis of geographic area, and a seventh section deals with miscellaneous material not tied to a specific geographic location. The six main geographic subdivisions are shown on Figure 2. The sections are arranged as follows:

Section A: Material dealing with Beringia as a whole.

As well as references with a very broad regional coverage, this section includes many citations that deal specifically with the Beringian Land Bridge.

Section B: Eastern Beringia

East Beringia mainly comprises Alaska, Yukon, and the western Northwest Territories, bounded to the east by the Mackenzie River. Areas of adjacent northern British Columbia and northwestern Alberta are also included. Many additional references dealing with the Late Quaternary of Alberta and northern British Columbia were included in a previous volume (Beaudoin 1989) and thus are not repeated here.

Section C: Western Beringia

West Beringia comprises Siberia as far west as the Lena River and the former Soviet Far East, including Kamchatka, Chukotka, Sakhalin Island and Primor'ye. Some articles dealing with the region between the Lena and Yenisey Rivers and the Lake Baikal area are also included. References in this section have not generally been keyed to the administrative or political subdivisions (e.g., Yakutia) within this region.

Section D: Northeastern China

This region comprises north China, primarily Heilongjiang, Jilin and Liaoning Provinces (Figure 3), and northern Korea. This section also includes references dealing with the region around Beijing, particularly the Zhoukoudian site, and parts of Nei Mongol (Inner Mongolia Autonomous Region). Some citations dealing with the Loess Plateau (centred on Gansu and Shaanxi Provinces and Ningxia Hui Autonomous Region) have been included because the terrestrial records from the loess sequences are fast becoming a framework for the Northeast Asian Late Quaternary. In addition, these records may be compared with oceanic records obtained from cores from the northern Pacific Ocean.

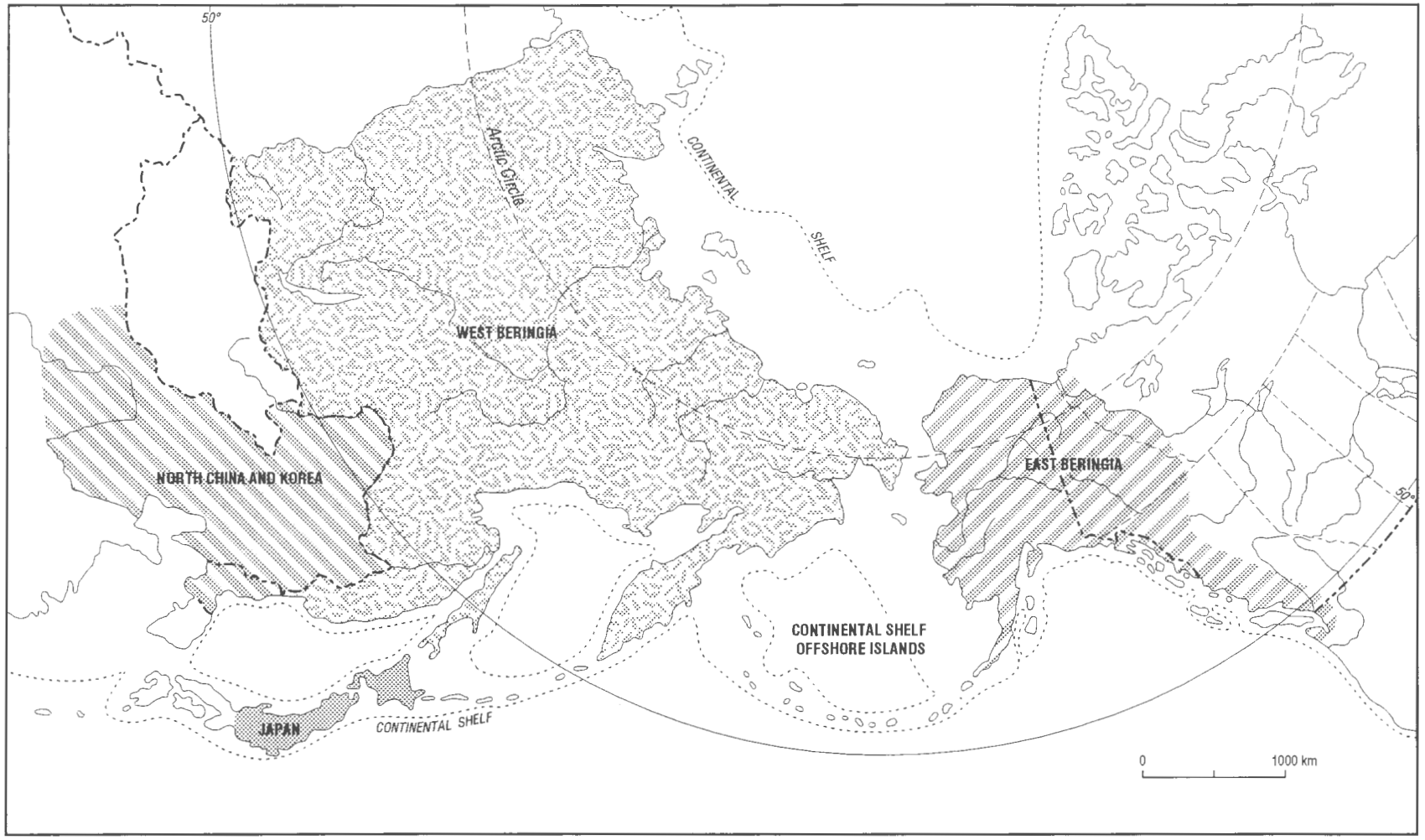

Figure 2: Subdivisions of Beringia used for organizing the citations.

Section E: Japan

References in this section are focussed mainly on northern Japan, especially Hokkaido, because of its close geographic link with northeast Asia, particularly across the exposed continental shelf and from Sakhalin Island.

Section F: Offshore and Continental Shelf

This comprises areas of the continental shelf fringing northeast Asia and northwestern North America. This region also includes offshore islands, including the Queen Charlottes, Vancouver Island, the Aleutian Islands etc. Some areas of coastal British Columbia and northwest Washington are also included here because their records often provide details of sea-level fluctuations. When sea-level was significantly lower than present during the last glaciation, much of these continental shelf areas would have been terrestrial and therefore would have been available for human occupation and migration.

Section G: Miscellanea

This section includes mainly popular articles, conference reports, and commentaries. Articles may deal with any area of Beringia and the section is not subdivided further.

Within each of the six geographic sections outlined above, the references are further categorized by major topic into a maximum of six subsections, as follows:

Part 1: General

This comprises mainly review articles with broad topical coverage.

Part 2: Late Quaternary geology

This comprises principally studies on surficial geology and stratigraphy, glacial history and glacial geomorphology.

Part 3: Late Quaternary palaeoenvironments

This includes mainly pollen studies, and research using fossil beetles, plant macrofossils, ostracodes, and molluscs. It also includes studies focussed on climate history.

Part 4: Late Quaternary palaeontology

This comprises mainly studies on terrestrial mammal vertebrate remains, but also includes studies on fish, marine mammals, and bird remains.

Part 5: Archaeology and human history

This includes archaeological site studies, some reports, and palaeoanthropological studies, particularly focussing on human dentition and human genetics. This section also includes discussion of lithic artifacts and human migration. We have not surveyed the large body of literature dealing with early hominids in east Asia, the *Homo erectus* remains of China (e.g., at Zhoukoudian) or the emergence of anatomically modern humans. Readers are referred to recent compilations by Wu and Olsen (1985) and Nitecki and Nitecki (1994) for further details on these topics.

Part 6: Modern biogeography

This includes studies of taxa whose modern distribution provides significant information on their Late Quaternary migration. The section also includes some genetic studies that are focussed specifically on elucidating former distributions or migration history.

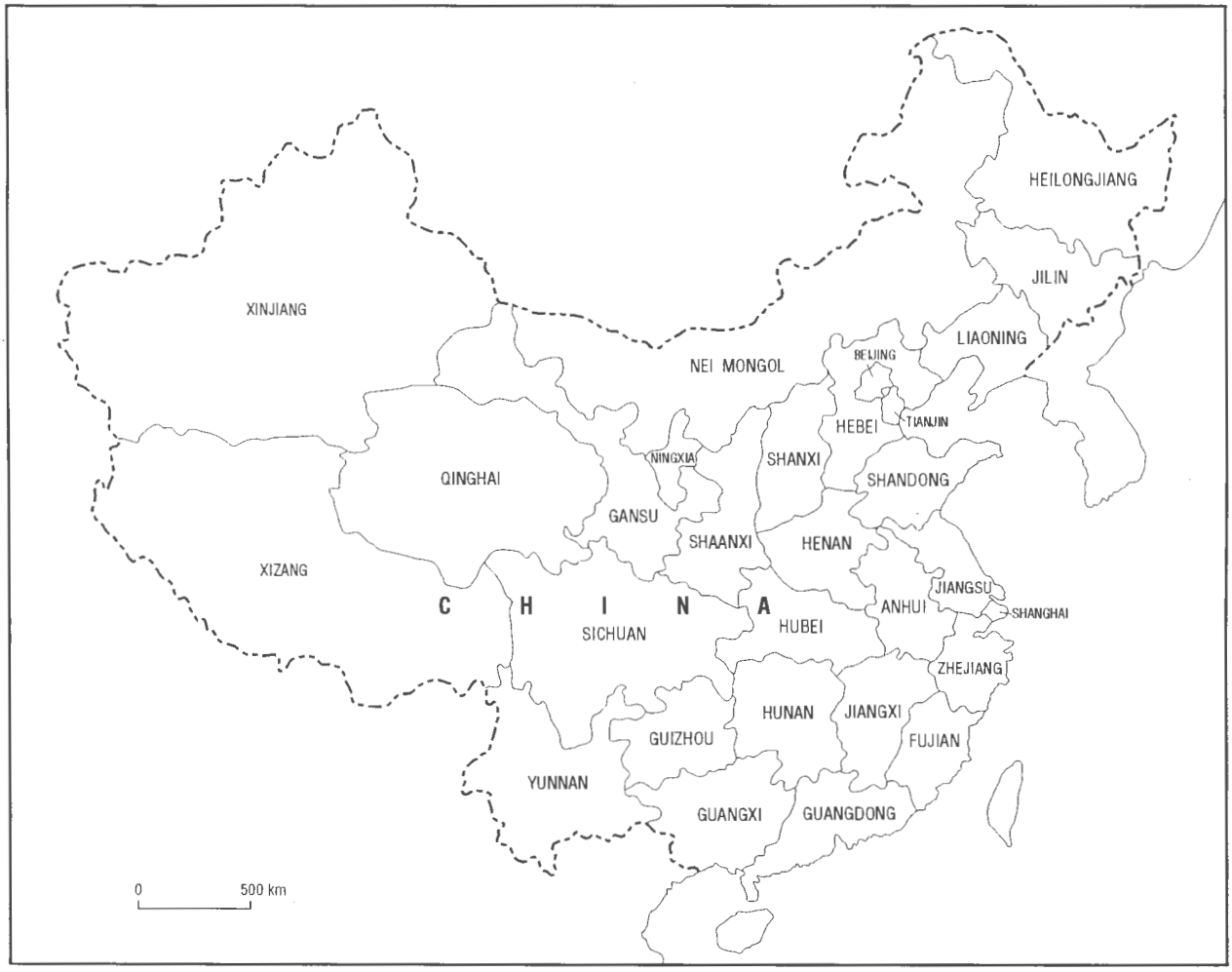

Figure 3: The Provinces of China

LIBRARY LOCATION AND SOURCES

The library location of the reference, together with its call number, when known, is included. This bibliography was primarily intended for local use, by researchers within Alberta. The majority of the references were obtained through the University of Alberta Library System. In some cases, several locations and call numbers are presented. The University of Alberta, except for specialized libraries such as the Special Collections and Circumpolar Libraries, uses the Library of Congress cataloguing system. This system is widely used at many other North American libraries, and therefore the call numbers may be applicable at other institutions.

The abbreviations used for the main library locations follow the Symbols of Canadian Libraries, as recommended by the National Library of Canada (1987). These abbreviations are as follows:

AE - Edmonton Public Library, Main Branch, Edmonton
AEA - Historical Resources Division Library, Edmonton
AEU - University of Alberta Library, Edmonton

The University of Alberta's On-Line Catalogue lists several locations within the library system where relevant publications may be found:

GOV DOC - Government Publications, Cameron Library
HSS - Humanities and Social Sciences, Rutherford Library North
PMC - Periodicals and Microform Centre, Rutherford Library South
PHYSC - Physical Sciences, Chemistry Building
POLAR - Canadian Circumpolar Library, affiliated with the Canadian Circumpolar Institute, housed in the basement of Cameron Library
RF - Reference collection. This applies to some books in most University of Alberta libraries. These volumes do not circulate.
SCI - Science and Technology, Cameron Library
SP COLL - Bruce Peel Special Collections Library, Rutherford Library South. These volumes do not circulate.

Some archaeological journals and publications are kept in a small library at the Provincial Museum of Alberta, the location of the Archaeological Survey. In this document, this library is coded as follows:

AEA PMA/ASA - Archaeological Survey, Provincial Museum of Alberta

A number of references could not be traced through the library system, and were only available through loans from private collections. These references have no location code. In general, we tried to avoid including publications of this type, other than conference abstracts and field trip guides, because they are so difficult to obtain and are not widely available. For similar reasons, we did not try to track down documents cited in the sources as "Unpublished manuscript in possession of the author", "Manuscript in preparation", "In press", or a similar category.

This compilation includes a few theses, mainly those produced at the University of Alberta. We are aware of many theses dealing with Beringia produced at Universities across North America. In most cases, theses cannot be borrowed or are only available on microfilm. Hence these are not included in this bibliography.

If not locally available, many of these publications may be obtained through inter-library loan services. Holdings of periodicals in Canadian libraries are listed in the Union List of Scientific Serials in Canadian Libraries (Canada Institute for Scientific and Technical Information 1985). However, users should consult

their own library for advice on obtaining material from their nearest library location. Many library catalogues world-wide are now available electronically through CWIS (Campus Wide Information Service).

ANNOTATIONS AND INDEXING

Where ever possible, each paper, monograph or book chapter is accompanied by its abstract. The abstract is reproduced exactly as given in the original source, including any typographical or grammatical errors, which are indicated by [sic]. However, this annotation has been used sparingly in the case of translated articles, where such occurrences may be numerous. In instances where no abstract was available, we have sometimes used a summary or concluding section as an abstract; these are often abbreviated. In these instances, we have included a note stating our procedure. Conference abstracts are not reproduced. Figure references and citations are generally omitted from abstracts.

With each citation, we have appended some additional annotations. This information has been used to compile a detailed index which can be found at the end of the bibliography (pp. 344-386). The annotations include the library location, the geographic location of the research, an indication of the main topics discussed, and the language (if other than English) of the original publication. Notes highlight specific details for individual references, such as additional publication data. Each reference is indexed by author(s), geographic location(s), library location(s), and topic(s) and thus appears under several categories in the index.

Geographic locations reflect the main focus of each reference. However, some papers, particularly summary or review articles, may have very broad geographic coverage, dealing with areas remote from this project, such as Australasia or South America, as well as Beringia. These other geographic areas are not indexed in this compilation. References dealing with Inner Mongolia (Nei Mongol Autonomous Region) are indexed under "China - northern". References that deal specifically with Mongolia are indexed separately.

A number of general categories are used to code each reference by topic(s), e.g., glacial geomorphology, pollen analysis. In addition, when the reference is dealing with a limited, specific topic, this is also codified. These topic assignments are similar to the keywords used by many journals and bibliographic search services. The topics were chosen so as to reflect the main foci of each paper. For example, although many papers mention sections or deposits, only a limited number deal with stratigraphy as a main focus. However, we have tried to provide abundant indication of the subject-matter for each citation.

Bibliographic listings for taxa under faunal remains are given as cited in the literature; synonyms are numerous. For example, Pleistocene lions are listed under *Felis*, *Leo*, and *Panthera*, and mammoths under *Elephas*, *Mammuthus*, *Mammonteus*, and *Palaeoloxodon*. Other common synonyms include: *Aenocyon* for *Canis*, *Hyaena* for *Crocuta* (in part), and *Mastodon* for *Mammut*. More obscure synonyms may exist of which we are unaware. In addition, authors differ on the ranking of taxa. For example, North America Pleistocene lions have been considered a subspecies (as *Panthera leo atrox*) or a species (as *P. atrox*). In the index, faunal remains are keyed to the genus or species level where possible. In some cases (e.g., for *Bison*), the literature exhibits a plethora of species and subspecies; in these cases, to avoid a nomenclatural morass, a few species are indexed separately but most entries are keyed to genus. Common names for fauna (and some major plant taxa) in the index are listed in the following table. Extinct taxa are indicated. The listing of faunal remains concentrates on mammals but also includes some birds, amphibians and fish.

Linnaean name	Common name
Acinonyx jubatus	Cheetah
Aenocyon dirus	synonym for *Canis dirus*, Dire wolf, extinct
Ailuropoda melanoleuca	Giant panda
Alces alces	Moose
Alces latifrons	Broad-fronted moose, extinct
Allactaga sibirica	Mongolian five-toed jerboa
Alopex lagopus	Arctic fox
Antilocapra	Pronghorn
Arctodus simus	Giant short-faced bear, extinct
Bison priscus	Steppe bison, extinct
Bootherium	Helmeted muskox, extinct
Bos grunniens	Yak
Bos primigenius	Aurochs, extinct
Brachyprotoma obtusata	Short-faced skunk, extinct
Bubalus	Water buffalo
Bufo	Toad
Camelops	Western camel, extinct
Camelus knoblocki	Wild camel
Canis familiaris	Domestic dog
Canis latrans	Coyote
Canis lupus	Wolf
Capra sibirica	Siberian ibex
Capreolus	Roe deer
Capreolus pygargus	Siberian roe deer
Castor canadensis	North American beaver
Castoroides	Giant beaver, extinct
Cervalces	Stag-moose, extinct
Cervalces alaskensis	Broad-fronted moose, extinct
Cervus canadensis	Wapiti
Cervus elaphus	Elk, Red deer
Citellus	synonym for *Spermophilus*, Souslik
Clethrionomys gapperi	Red-backed vole
Clethrionomys rutilus	Northern red-backed vole
Coelodonta antiquitatis	Woolly rhinoceros, extinct
Crocuta	Spotted hyaena
Crocuta spelaea	Cave hyaena, extinct
Cuon alpinus	Dhole, Asiatic wild dog
Dicrostonyx torquatus	Collared lemming
Elephas maximus	Asiatic elephant
Elephas namadicus	Extinct elephant
Elephas primigenius	synonym for *Mammuthus primigenius*, Woolly mammoth
Enhydra lutris	Sea otter
Equus asinus	African wild ass
Equus caballus	Wild horse, tarpan
Equus conversidens	Mexican horse, extinct
Equus hemionus	Asiatic wild horse
Equus kiang	Kiang
Equus lambei	Lambe's horse, extinct
Equus przewalskii	Przewalski's horse
Erethizon	Porcupine

Linnaean name	Common name
Erinaceus	Hedgehog
Esox lucius	Northern pike, Jackfish
Felis atrox	= *Panthera leo atrox*, American lion
Felis tigris	Tiger
Gazella	Gazelle
Gazella subgutturosa	Goitred gazelle
Gulo gulo	Wolverine
Homotherium	Scimitar cat, extinct
Hydrodamalis gigas	Steller's sea-cow, extinct
Lagopus lagopus	Willow ptarmigan
Lemmus sibiricus	Brown lemming
Lepus americanus	Snowshoe hare, Varying hare
Lepus arcticus	American arctic hare
Lepus othus	Arctic hare
Lepus tanaiticus	Don hare
Lepus timidus	Blue hare, Mountain hare
Lepus tolai	Tolai hare
Lutra lutra	Eurasian otter
Mammut americanum	American mastodon, extinct
Mammuthus columbi	Columbian mammoth, extinct
Mammuthus imperator	Imperial mammoth, extinct
Mammuthus primigenius	Woolly mammoth, extinct
Marmota bobak	Steppe marmot
Marmota monax	Woodchuck
Martes zibellina	Sable
Megaloceros ordosianus	Giant elk, extinct
Megalonyx	Megalonychid ground sloth, extinct
Meles meles	Eurasian badger
Microtus gregalis	Narrow-skulled vole
Microtus miurus	Alaskan vole
Microtus xanthognathus	Yellow-cheeked vole
Moschus moschiferus	Musk deer
Mustela erminea	Ermine, Stoat, Short-tailed weasel
Mustela eversmanni	Asiatic polecat
Mustela nivalis	Eurasian weasel
Mustela vison	American mink
Myospalax	Mole-rat
Myospalax fontanieri	Chinese zokor
Myospalax psilurus	Manchurian zokor
Nemorhaedus goral	Grey goral
Nyctereutes procyonoides	Raccoon dog
Ochotona	Pika
Ochotona collaris	Collared pika
Ochotona daurica	Daurian pika
Odobenus rosmarus	Walrus
Ondatra zibethicus	Muskrat
Ovibos moschatus	Muskox
Ovis ammon	Argali
Ovis dalli	Dall sheep
Panthera atrox	= *Panthera leo atrox*

Linnaean name	Common name
Panthera leo atrox	American Pleistocene lion, extinct
Panthera pardus	Leopard
Panthera spelaea	Cave lion, extinct
Panthera tigris	Tiger
Peromyscus	Deer mouse
Platygonus compressus	Flat-headed peccary, extinct
Poëphagus grunniens	synonym for *Bos grunniens*, Yak
Praeovibos	Extinct muskox
Rana	Frog
Rangifer tarandus	Caribou, Reindeer
Saiga tatarica	Saiga antelope
Selenarctos thibetanus	Asiatic black bear, Himalayan bear
Smilodon	Sabretoothed cat, extinct
Sorex	Shrew
Spermophilus columbianus	Columbian ground squirrel
Spermophilus parryii	Arctic ground squirrel
Spilogale	Spotted skunk
Spirocerus kiakhtensis	Kijachta antelope, extinct
Struthio	Ostrich
Sus scrofa	European wild boar
Symbos	synonymous with *Bootherium*, Helmeted muskox, extinct
Synaptomys borealis	Northern bog lemming
Taxidea taxus	American badger
Thymallus arcticus	Arctic grayling
Ursus americanus	Black bear
Ursus arctos	Brown bear, Grizzly bear
Ursus spelaeus	Cave bear, extinct
Ursus thibetanus	Asiatic black bear
Vulpes corsac	Corsac fox
Vulpes lagopus	synonym for *Alopex lagopus*, Arctic fox
Vulpes vulpes	Red fox
Abies	Fir
Alnus	Alder
Betula	Birch
Carex	Sedge
Ceratophyllum	Hornwort
Corispermum	Bugseed
Cryptomeria japonica	Japanese cedar
Draba	Draba, Whitlow-grass
Dryas	Avens
Equisetum	Horsetail
Larix	Larch
Najas flexilis	Slender naiad
Picea	Spruce
Pinus	Pine
Populus	Poplar, Aspen
Potamogeton	Pondweed
Potentilla	Cinquefoil
Salix	Willow
Tsuga	Hemlock

Terminology and common names for extinct fauna in the preceding table follow Kurtén (1968) and Kurtén and Anderson (1980).

Personal names in the citations are given exactly as in the published sources. Some authors may use different initials in publications; to avoid confusion, these writers only appear under one entry in the index, although alternate forms of names are indicated. The author index also includes editors and translators. When people are exclusively translators, they have been explicitly identified as such in the index. The "editor" category may include people listed in the sources as "compilers" or "directors".

Chinese personal names may appear in many forms in publications, e.g., Liu Tungsheng, Liu Tung Sheng, etc. In the index, all forms of each Chinese name are keyed to one index entry. The format for Chinese names was selected so as to conform with generally accepted modern usage, e.g., Liu Tung-sheng. Chinese names are formulated with the family name first.

GLOSSARY OF TERMS AND ABBREVIATIONS

Because this bibliography gathers information from many sources, different terms are sometimes used for the same place by different writers. For instance, Chinese and Russian writers sometimes use different names for locations in the Amur River basin. In addition, place names in China may appear different according to whether they are rendered in the Wade-Giles (WG) or modern Pinyin (P) system. The following glossary may clarify some of these terms. The glossary also includes some common abbreviations that may occur throughout the citations and some terms that are no longer in current usage.

Term	Definition, meaning, or equivalent
AK	Alaska
Amur River	Heilongjiang or Black Dragon River. The river forms the boundary between China and Siberia.
AMS	Accelerator Mass Spectrometry, a form of radiocarbon dating.
Beijing (P)	Peking (WG)
BP	before present, strictly before the baseline for radiocarbon dating, 1950 A.D.
Choukoutien	Zhoukoudian ("Peking Man's Cave")
Enkako	Yanjiagang, an archaeological site near Harbin
GSA	Geological Society of America
GSC	Geological Survey of Canada
Heilongjiang	Means "Black Dragon River", Amur River
Heilungkiang (WG)	Heilongjiang (P)
Hopei Province (WG)	Hebei Province (P)
IGCP	International Geological Correlation Programme
IVPP	Institute of Vertebrate Palaeontology and Palaeoanthropology, Beijing
Jiang	River
Jijihaer	Qiqihar, a city in the west of Heilongjiang
ka	thousands of years (as in 15 ka BP = 15,000 years BP)
K/Ar	Potassium/Argon, a dating technique.
Kirin (WG)	Jilin (P)
LGM	Last Glacial Maximum
LIG	Last Interglacial
Manchuria	Region comprising Northeast China, roughly equivalent to modern Heilongjiang, Jilin and Liaoning Provinces (Figure 3)

Term	Definition, meaning, or equivalent
N.A.	not applicable, or not available
n.d.	no date
NTS	National Topographic System
NWT	Northwest Territories
Peking (WG)	Beijing (P)
RCYBP	radiocarbon years before present
RSL	relative sea level
Salawusu River	Sjara-osso-gol, a palaeontological locality in Inner Mongolia
Shensi Province (WG)	Shaanxi Province (P)
Sjara-osso-gol	a palaeontological locality in Inner Mongolia, now generally termed Salawusu River
Songhua River	Sungari River, a major river in northeast China, flowing through Heilongjiang, a tributary to the Amur River
sp.	species (s.)
spp.	species (pl.)
ssp.	subspecies (s.)
s. str.	sensu stricto, strictly speaking, or in the narrow sense
Sungari River	Songhua River
TL	thermoluminescence, a dating technique
Tsitsihar	Qiqihar, a city in the west of Heilongjiang
USGS	United States Geological Survey
Ussuri River	Wusuli Jiang, part of Heilongjiang's eastern border, between China and Russia
VGP	virtual geomagnetic pole, a term used in palaeomagnetic studies
Wusuli Jiang	Ussuri or Yussuri River
Yanjiagang	Enkako, an archaeological site near Harbin
Zhoukoudian	Choukoutien ("Peking Man's Cave")

REFERENCES

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1989 Annotated Bibliography: Late Quaternary Studies in Alberta's Western Corridor 1950-1988. Archaeological Survey of Alberta Manuscript Series No. 15. Alberta Culture and Multiculturalism, Edmonton, Alberta, xvii + 362 pages.

Canadian Institute for Scientific and Technical Information

1985 Union List of Scientific Serials in Canadian Libraries. Eleventh Edition. National Research Council of Canada, Ottawa, Ontario.

Derbyshire, E.

1987 A History of Glacial Stratigraphy in China. Quaternary Science Reviews 6: 301-314.

Fladmark, K. R.

1983 Times and Places: Environmental Correlates of Mid-to-Late Wisconsinan Human Population Expansion in North America. In *Early Man in the New World*, edited by R. Shutler Jr., pp. 13-41. Sage Publications, Beverly Hills, California.

Hopkins, D. M., J. V. Matthews Jr., C. E. Schweger, and S. B. Young (editors)
1982 *Paleoecology of Beringia*. Academic Press, New York, New York. xiv + 489 pp.

Kurtén, B.
1968 *Pleistocene Mammals of Europe*. Aldine Publishing Company, Chicago, Illinois. viii + 317 pp.

Kurtén, B., and E. Anderson
1980 *Pleistocene Mammals of North America*. Columbia University Press, New York, New York. xviii + 442 pp.

Liu Tung-sheng, and Li Xing-guo
1984 Mammoths in China. In *Quaternary Extinctions: A Prehistoric Revolution*, edited by P. S. Martin and R. G. Klein, pp. 517-527. University of Arizona Press, Tucson, Arizona.

National Library of Canada
1987 Symbols of Canadian Libraries 1987. Twelfth Edition. National Library of Canada, Ottawa, Ontario.

Nitecki, M. H., and D. V. Nitecki (editors)
1994 *Origins of Anatomically Modern Humans*. Plenum Press, New York, New York. 320 pp.

Turner II, C. G.
1983 Dental Evidence for the Peopling of the Americas. In *Early Man in the New World*, edited by R. Shutler Jr., pp. 147-157. Sage Publications, Beverly Hills, California.
1988 Ancient Peoples of the North Pacific Rim. In *Crossroads of Continents: Cultures of Siberia and Alaska*, edited by W. W. Fitzhugh and A. Crowell, pp. 111-116. Smithsonian Institution Press, Washington, D.C.

Wu Rukang and J. W. Olsen (editors)
1985 *Palaeoanthropology and Palaeolithic Archaeology in the People's Republic of China*. Academic Press, Orlando, Florida. xxviii + 293 pp.

You Yu-Zhu, Xu Qi-Qin, Li Yi, and Ho Chuan-Kun
1986 Seasonality and Site Structure of Late Paleolithic Sites from Northeast China. Current Research in the Pleistocene 3:97-102.

NOTES

This bibliography is intended purely as an information resource. Although we have made every attempt to be accurate, consistent and wide-ranging, mistakes are bound to have crept in. We acknowledge responsibility for errors and would appreciate having our attention drawn to significant mistakes.

SECTION A. MATERIAL DEALING WITH BERINGIA AS A WHOLE

PART 1. GENERAL

Aigner, J. S.

1984 The Asiatic-New World Continuum in Late Pleistocene Times. In *The Evolution of the East Asian Environment, Volume I, Geology and Palaeoclimatology*, edited by R. O. Whyte, pp. 915-937. Centre of Asian Studies, University of Hong Kong, Hong Kong.

American Indians are a group of population systems not closely related to American Eskimos and Aleuts or to Asian populations who comprise the rest of the Bering Sea Mongoloids - the Chukchi, Koryak and Kamchadal. Furthermore, American Indian populations are remote, biologically speaking, from most living Asiatic Mongoloids. This biological distance suggests: (1) considerable time-depth in the New World for American Indian groups, (2) separate origin for American Indian groups from Eskimos and Aleuts, and (3) probable derivation for American Indian groups from Pleistocene-aged northeast Asian Mongoloids.

While the timing of entry into the New World of Aleuts and probably Eskimos is terminal Pleistocene, and the route is very likely along the western north Pacific to southern Beringian coast ..., the timing and entry of American Indians is less clear. Among the terminal Pleistocene and earlier New World and Asian assemblages, only the Beringian-north East Asian microcore and microblade manufacturing have clear connections. These systems are frequently referred to as Proto-Diuktai and Diuktai in Siberia, Xiyu in China, Yubetsu and other names in Japan, the Paleo-Arctic or Denali in America. The observed technological affinities are said to be historical in nature, linking northern East Asia, Siberia, and American Beringia in Late Pleistocene times ... American workers have conceptualized the distribution of the microcore and microblade technologies as the Late Pleistocene expansion of humans with, and within, a single ecosystem - the steppe-tundra of Siberia and northwestern America (that is, Beringia) some 30,000 to 14,000 years ago ...

There are some misconceptions about the distribution of the technologies in time and space, their ecologic parameters, and the level of comparison and therefore the *meaning* of observed affinities. This paper is concerned with three aspects relating to the "Asiatic-New World continuum" and thereby to the origin of some American peoples:

1. Form and function of, and the level of affinity which, the microcore and microblade manufacturing technology reflect - are we talking about a *culture*, about *culture groups* or a far-flung *technocomplex* ... The level of affinity, or our interpretation of degree of relatedness, has implications for historic reconstructions of population movements.
2. Beringian ecology, specifically the meaning of the term "steppe-tundra", for the period of interest *vis-à-vis* East Asia, Siberian and New World connections (40,000-10,000 years ago). The ecological subperiods and associated faunistic richness of the "steppe-tundra" have implications for our reconstruction of the timing and human adaptation of Asiatic movements into America.
3. Implications of One and Two for a current understanding of Asiatic-New World connections.

Notes: Introduction modified for abstract, references omitted.
Area: Beringia, Siberia, Japan, China, Alaska
Topics: Beringian ecology, Review of archaeological approaches, Review of lithic assemblages, Archaeological sites, Cultural traditions, Human migration

Fagan, B. M.

1987 *The Great Journey: The Peopling of Ancient America*. Thames and Hudson Inc., New York, New York. 288 pp.

Location: AEU HSS RESERVE ANTH 146
Area: Beringia, Eastern Beringia
Topics: Archaeological sites - Siberia, Archaeological sites - Eastern Beringia, Human migration, Hominid evolution, Dentition, Lithics, Palaeontological sites, Faunal remains, Beringian environment, Ice-free corridor

Hopkins, D. M. (editor)

1967 *The Bering Land Bridge*. Stanford University Press, Stanford, California. 495 pp.

Notes: Individual papers from this volume are cited elsewhere in appropriate sections of this bibliography.
Location: AEU SCI QE 39 H79
Topics: Review of glacial history - Beringia, Review of pollen records - Beringia, Review of faunal remains - Beringia, Sea level changes

1967 The Cenozoic History of Beringia - A Synthesis. In *The Bering Land Bridge*, edited by D. M. Hopkins, pp. 451-484. Stanford University Press, Stanford, California.

Notes: Based on a Symposium held at the VII Congress of the International Association for Quaternary Research (INQUA), Boulder, Colorado, 1965.
Location: AEU SCI QE 39 H79
Area: Beringia
Topics: Review of climate history - Beringia, Vegetation history, Pollen records, Plant macrofossils - wood, Aeolian deposits, Faunal remains, Tectonism, Faunal migration, Molluscs - marine, Beringian land bridge connection, Faunal extinction, Review of glacial history - Beringia, Human migration, Sea level changes

1976 A Model for Ancient Population Movements in and Through Beringia. In *AMQUA, 4th Biennial Meeting, Tempe, Arizona, Abstracts*, pp. 5-7.

Area: Beringia, Western Beringia, Japan
Topics: Beringian land bridge connection, Human migration, Glacial history, Sea level changes, Beringian ecology

1983 Hard Times in Beringia: A Short Note. In *Quaternary Coastlines and Marine Archaeology: Towards the Prehistory of Land Bridges and Continental Shelves*, edited by P. M. Masters and N. C. Flemming, pp. 345-346. Academic Press, New York, New York.

Location: AEU HSS GN 741 Q22
Area: Beringia
Topics: Glacial history, Sea level changes, Human migration, Climate history, Vegetation history, Megafauna, Beringian environment

Hopkins, D. M., J. V. Matthews Jr., C. E. Schweger, and S. B. Young (editors)
1982 *Paleoecology of Beringia*. Academic Press, New York, New York. xiv + 489 pp.

Notes: Proceedings from a Symposium on "Paleocology of Beringia", sponsored by the Wenner-Gren Foundation for Anthropological Research (Symposium #81), held at Burg Wartenstein, Austria, June 8-17, 1979. Individual chapters are cited in appropriate sections of this bibliography.
Location: AEU SCI QE 720 W47, AEA PMA/ASA 560.45 P174
Area: Beringia
Topics: Review of glacial history - Beringia, Review of pollen studies - Beringia, Biogeography - Beringia, Zoogeography, Review of archaeology - Beringia

Matthews Jr., J. V.
1979 *Beringia During the Late Pleistocene: Arctic-Steppe or Discontinuous Herb-Tundra? A Review of the Paleontological Evidence*. Geological Survey of Canada Open File 649. Geological Survey of Canada, Ottawa, Ontario. 60 pp.

Notes: Preprint prepared for discussion at Burg Wartenstein Symposium No. 81: Paleoecology of the Arctic-Steppe Mammoth Biome, 8-17 June 1979, sponsored by the Wenner-Gren Foundation, New York.

Location: AEU POLAR 56:552.79:(*40) MAT
Area: Beringia
Topics: Beringian ecology, Review of stratigraphy - Beringia, Review of pollen analyses - Beringia, Review of plant macrofossils - Beringia, Review of insect macrofossils - Beringia, Review of faunal remains - Beringia, Faunal extinction, Tephra - Alaska

Rychkov, Y. G., and V. A. Sheremet'eva

1986 Genetic and Anthropological Aspects of the "Man and Environment" Problem in the Beringian Region. Translated by R. Chakravarty. In *Beringia in the Cenozoic Era*, edited by V. A. Kontrimavichus, pp. 620-630. Russian Translation Series No. 28. A. A. Balkema, Rotterdam, The Netherlands.

Results of populational and genetical studies of the indigenous population of North Asia suggest that, in spite of the specific archaeological development of the Upper Paleolithic cultures in America, the initial genetic relationship of the indigenous peoples of Siberia and America was so close as to indicate two territorially adjacent subpopulations of a single tribe stock.

Within the limits of the North Asiatic branch of the population, which was essentially one in ancient times, it is possible to trace a succession and virtually complete preservation of the gene find up to the Neolithic epoch, characterized by relevant finds in the Baikal Lake region and further inland.

Over the past millennia this population showed an enormous genetic differentiation, mainly due to random gene drift.

Unlike the continental regions of North Asia, the random gene drift in Beringia is opposed by such high stabilizing environmental pressure that the populations, despite their ancient separation, genetically all remain surprisingly similar.

A special study of the Aleutian populations in the Komandorskiye Islands showed that the nonadaptive divergence lasting only a few generations was accompanied by substantial deterioration of population demography.

Notes: Translation of *Beringiya v Kainozoe*, Vladivostok, 1976. Collection of papers presented at the All-Union Symposium "The Bering Land Bridge and its Role in the History of Holarctic Floras and Faunas in the Late Cenozoic" held at Khabarovsk in May, 1973.
Location: AEU POLAR 56:(*3) KON
Area: Beringia, Siberia, Aleutian Islands, Komandorskiye Islands
Topics: Human genetics

Schweger, C. E.

1990 The Full-Glacial Ecosystem of Beringia. In *Prehistoric Mongoloid Dispersals No. 7 Special Issue*, pp. 35-51. Prehistoric Mongoloid Dispersal Project, The University Museum, The University of Tokyo, Tokyo, Japan.

Area: Beringia
Topics: Beringian ecology, Glacial history, Sea level changes, Climate history, Vegetation history, Faunal remains, Palaeosols, Loess

Schweger, C. E., J. V. Matthews Jr., D. M. Hopkins, and S. B. Young

1982 Paleoecology of Beringia - A Synthesis. In *Paleoecology of Beringia*, edited by D. M. Hopkins, J. V. Matthews Jr., C. E. Schweger and S. B. Young, pp. 425-444. Academic Press, New York, New York.

Location: AEU SCI QE 720 W47, AEA PMA/ASA 560.45 P174
Area: Beringia
Topics: Review of glacial history - Beringia, Sea level changes, Beringian ecology, Review of vegetation history - Beringia, Review of faunal remains - Beringia, Review of climate history - Beringia, Review of pollen analyses - Beringia, Review of insect macrofossils - Beringia, Palaeosols, Faunal extinction, Loess, Human migration, Review of archaeological sites - Beringia

PART 2. LATE QUATERNARY GEOLOGY

Arkhipov, S. A., V. G. Bespaly, M. A. Faustova, O. Y. Glushkova, L. L. Isaeva, and A. A. Velichko
1986 Ice-Sheet Reconstructions. Quaternary Science Reviews 5:475-483.

Notes: Special volume, *Quaternary Glaciations of the Northern Hemisphere*, edited by V. Sibrava, D. Q. Bowen, and G. M. Richmond. Report of IGCP Project 24.
Location: AEU SCI QE 696 Q245
Area: Western Beringia, Eastern Beringia
Topics: Glacial history, Glacial geomorphology, Ice limit reconstruction

Berger, G. W.
1989 Comment on the Present Status of Dating Loess by Thermoluminescence. In *Late Cenozoic History of the Interior Basins of Alaska and the Yukon*, edited by L. D. Carter, T. D. Hamilton and J. P. Galloway, pp. 103-105. Circular 1026. United States Geological Survey.

Location: AEU SCI QE 75 C57
Area: Alaska
Topics: Loess - dating, Dating - TL methodology, Tephra - Old Crow

Hopkins, D. M.
1959 Cenozoic History of the Bering Land Bridge. Science 129:1519-1528.

Many facts of paleontology and biogeography indicate that the Old and New Worlds have sometimes been connected by a continuous land route that extended from Alaska across the present shallow floors of the Bering and Chukchi seas to Siberia. Recent geologic studies in western Alaska permit a more detailed consideration of the times at which the land bridge existed during the last 50 million years of Tertiary and Quaternary time. Some well-founded inferences can also be drawn concerning the climate and vegetation that prevailed on the land bridge during the last (Wisconsin) glacial interval, the most recent period during which the land bridge existed.

Notes: Abstract modified from introduction.
Location: AEU SCI Q 1 S41
Area: Beringia, Bering-Chukchi platform
Topics: Sea level changes, Review of glacial history - Beringia, Beringian vegetation, Review of vegetation history - Beringia, Beringian land bridge connection

1973 Sea Level History in Beringia During the Past 250,000 Years. Quaternary Research 3:520-540.

This paper attempts to relate current knowledge of sea-level history in Beringia to the Broecker-van Donk "Termination" concept of climatic and sea-level history. The Einahnuhtan transgression is thought to represent Termination III, which according to Broecker and van Donk, took place about 225,000 y.a. The Kotzebuan transgression is thought to represent a positive fluctuation that modulated the generally falling sea level during the ensuing 100,000 yr. Sea level probably fell to about -135 m in the Bering Sea area during the maximum phase of the penultimate glaciation. The two Pelukian shorelines probably represent Termination II (about 125,000 yr BP in the Broecker-van Donk chronology) and one of the two positive fluctuations that modulated the generally falling sea level of early Wisconsinan time, about 105,000 and 80,000 y.a. according to Broecker and van Donk. Another positive modulation brought sea level to at least -20 m, about 30,000 y.a. Sea level evidently fell to between -90 and -100 m during the late Wisconsinan regression, but a substantial part of the outer Bering shelf remained submerged. Submerged shoreline features at -38m [sic], -30 m, -24 to -20 m, and -12 to -10 m represent stillstands or slight regressions that modulated Termination I, the late Wisconsinan, and early Holocene recovery of sea level.

Notes: Also published in *Beringia in the Cenozoic Era* (1986) edited by V. L. Kontrimavichus, pp. 3-29.
Location: AEU SCI QE 696 Q24
Area: Beringia
Topics: Sea level changes, Stratigraphy, Glacial history, Molluscs, Beringian land bridge connection

1982 Aspects of the Paleogeography of Beringia During the Late Pleistocene. In *Paleoecology of Beringia*, edited by D. M. Hopkins, J. V. Matthews Jr., C. E. Schweger and S. B. Young, pp. 3-28. Academic Press, New York, New York.

This paper reviews knowledge of Beringian glacial chronology, shoreline history, and paleoceanography.

The Happy, Boutellier, and Duvanny Yar intervals are named as subdivisions of the last (Wisconsin) cold cycle in Beringia. The Happy interval, which corresponds to the Itkillik Glaciation, was a cold interval that ended more than 60,000 and perhaps more than 80,000 years ago. The Boutellier interval was a long, complex interstadial interval that began 80,000 or 60,000 years ago and ended about 30,000 years ago. The Duvanny Yar interval was a cold, dry interval that corresponds to such modest glacial advances of late Wisconsin time as the Walker Lake Glaciation in the Brooks Range. An unnamed interval corresponding approximately to the birch pollen-assemblage zone and extending from 14,000 to 8500 years BP constitutes the transition to the climatic and landscape conditions that characterized most of the Holocene.

Sea level probably was low during the Happy interval. A return to approximately present sea level during deposition of the Flaxman Formation on the Beaufort Sea coast may correspond to a mesic, peat-forming episode that marked the beginning of the Boutellier interval. Sea level later fell to about -80 m but returned briefly to a level near -20 m about 42,000 years BP. Rising sea level seems to have submerged the Alaska-Siberia land connection as early as 15,500 years BP.

Many areas in Beringia show a record of moderate aeolian activity during the Boutellier interval, intense activity during the Duvanny Yar interval, diminishing activity during the time of the birch zone, and stabilization about 8500 years BP. During the Duvanny Yar interval, sand movement was active in winter as well as in summer. The paleowind data indicate winter circulation consisting of a counterclockwise gyre concentric to a low in the Gulf of Alaska and summer circulation consisting of southeasterly airflow from the Gulf of Alaska over coastal mountains to interior Beringia.

Location: AEU SCI QE 720 W47, AEA PMA/ASA 560.45 P174
Area: Beringia
Topics: Beringian land bridge connection, Sea level changes, Review of glacial history - Beringia, Beringian vegetation, Review of vegetation history - Beringia, Review of pollen studies - Beringia, Loess, Aeolian deposits

Hughes, T., R. Bonnichsen, J. Fastook, B. Hughes, and M. Grosswald

1991 Pleistocene Beringia: An Outright Land Bridge or a Glacial Valve Constraining Asian Migration to North America? In *INQUA, 13th International Congress, Beijing, China, Abstracts*, p. 144.

Area: Beringia
Topics: Glacial history, Beringian land bridge connection, Glacial lake sequences, Human migration

Khoreva, I. M.

1986 Foraminifers from the Pleistocene Deposits of the Bering Sea Coast and the Problem of the Bering Land. Translated by R. Chakravarty. In *Beringia in the Cenozoic Era*, edited by V. L. Kontrimavichus, pp. 46-49. Russian Translation Series No. 28. A. A. Balkema, Rotterdam, The Netherlands.

Benthonic foraminifers are preserved fairly well in natural outcrops of marine Pleistocene sediments of the Bering Sea coast.

Boreal-Arctic and Arctic foraminifers, which differ from those found in the Tertiary sediments of Kamchatka, Sakhalin and Alaska, were dominant in the Lower Pleistocene. Evidently, at that time the Bering Sea was connected with the Chukchi Sea via the Bering Strait, and foraminifers penetrated freely from the Arctic Ocean into the Bering Sea.

Middle Pleistocene deposits contain the most cold-water (Arctic) species. This undoubtedly indicates the close relationship between the Bering Sea and the Arctic Ocean.

The beginning of the Late Pleistocene was marked by a new transgression. The deposits of this time are represented very extensively and are characterized by a rich foraminifer complex, chiefly of Arcto-Boreal and Boreal-Arctic origin.

Zoogeographic analysis of the above complexes allows us to reconstruct the conditions of sediment accumulation in different times of the Quaternary period.

The recurrent formation of the Bering Strait in the Quaternary caused a wide exchange of faunas between the Arctic Ocean and the Bering Sea.

Notes: Translation of *Beringiya v Kainozoe*. Vladivostok, 1976. Collection of papers presented at the All-Union Symposium "The Bering Land Bridge and its Role in the History of Holarctic Floras and Faunas in the Late Cenozoic" held at Khabarovsk in May, 1973.
Location: AEU POLAR 56:(*3) KON
Area: Beringia
Topics: Sea level changes, Foraminifera, Beringian land bridge connection

Merklin, R. L., O. M. Petrov, D. M. Hopkins, and D. S. McNeil

1968 Correlation of Late Cenozoic Marine Deposits in Chukotka, Northeastern Siberia and Western Alaska. International Geology Review 10:335-344.

Only the marine fossils along the coasts which surround the Bering Sea can be correlated. The Krestovskaya sediments of the Chukotski region are probably the equivalent of the Kotsebue transgressive sediments in Alaska, and represent a maximum for Pleistocene water temperatures. Yet the sediments representing the minimum water temperature in mid-Pleistocene times do exhibit certain distinctive warm-water features.

Notes: Translated from Russian: Popytka korrelyatsii pozdnekaynozoyskikh morskikh osadkov Chukotki, severo-vostochnoy Sibiri i zapadnoy Alyaski, Izd. AN SSR, ser. geol., 1964, No. 10, pp. 10-57.
Location: AEU SCI QE 1 I612
Area: Eastern Beringia, Western Beringia
Topics: Stratigraphy, Molluscs, Sea level changes, Pollen records

Petrov, O. M.

1986 Geological History of the Bering Strait in the Late Cenozoic. Translated by R. Chakravarty. In *Beringia in the Cenozoic Era*, edited by V. L. Kontrimavichus, pp. 30-36. Russian Translation Series No. 28. A. A. Balkema, Rotterdam, The Netherlands.

This article gives a brief description of the geological history of the Bering Strait. The climate is shown to have generally worsened from Miocene to recent times, this tendency having been violated by weak warming phases in the Pleistocene. Based on paleomagnetic evidence, the border line between the Pliocene and Pleistocene is considered to date back to 1.8 million years ago. The existence of a strait in the "middle" Pliocene, Early and Middle Pleistocene during glaciations and interglaciations in the Late Pleistocene has been established more or less authentically. The Bering Land Bridge is assumed to have existed in the period extending from the second half of the Miocene to the Early Pliocene, and at the beginning of the Middle and Upper Pleistocene. The transformation of continental shallows of the Bering and Chukchi seas into vast areas of the Bering Land Bridge is reliably shown to have occurred during the Late Pleistocene glaciations. Tectonic movements had the main role in the formation of the land bridge or sea strait between Asia and America in the Late Cenozoic. The effect of the glaciostatic factor has been reliably established only for interglacial transgressions in the Late Pleistocene and in the times of late post-glaciations.

Notes: Translation of *Beringiya v Kainozoe*. Vladivostok, 1976. Collection of papers presented at the All-Union Symposium "The Bering Land Bridge and its Role in the History of Holarctic Floras and Faunas in the Late Cenozoic" held at Khabarovsk in May, 1973.
Location: AEU POLAR 56:(*3) KON
Area: Beringia
Topics: Stratigraphy, Climate history, Sea level changes, Beringian land bridge connection, Molluscs, Foraminifera, Pollen records, Tectonism

Péwé, T. L.

1976 Wind-Blown Dust in Hot and Cold Deserts During the Last Glaciation. In *AMQUA, 4th Biennial Meeting, Tempe, Arizona, Abstracts*, pp. 47-55.

Area: Western Beringia, Eastern Beringia
Topics: Loess, Aeolian deposits, Stratigraphy

Wintle, A. G.
1990 A Review of Current Research on TL Dating of Loess. Quaternary Science Reviews 9:385-397.

The thick loess deposits of China, Central Europe and North America are particularly suitable for the application of the thermoluminescence (TL) dating method because individual grains are likely to have travelled large distances and thus been well exposed to light before deposition. Wind-blown silt grains collected close to glacial rivers in Alaska have been shown to give a 'zero age' of not more than 2 ka, demonstrating the efficiency of the zeroing mechanism.

Differences in laboratory procedures can cause differences in the TL ages reported, particularly for loess over 100 ka. TL ages for interstadial soils in Europe are in agreement with the very few radiocarbon dates on reliable material, such as charcoal. On the other hand TL dates from sites in Belgium and north-western Germany indicate that the previously accepted chronology, which was based on two radiocarbon dates on humic-rich sediments, is incorrect.

The use to the 'last interglacial' palaeosol for assessing the TL dates on loess above and below it is limited by the uncertainty in the timing of termination of soil-forming processes; 107 and 71 ka are the limits suggested by the astronomically-derived time scale. Results on deposits from China, North America, Alaska and Europe are discussed in this context.

Location: AEU SCI QE 696 Q245
Area: China, Alaska
Topics: Loess - dating, Review of loess dating - TL, Palaeosols, Dating - TL, Tephra - Old Crow, Tephra - Sheep Creek

PART 3. LATE QUATERNARY PALAEOENVIRONMENTS

Barry, R. G.

1982 Approaches to Reconstructing the Climate of the Steppe-Tundra Biome. In *Paleoecology of Beringia*, edited by D. M. Hopkins, J. V. Matthews Jr., C. E. Schweger and S. B. Young, pp. 195-204. Academic Press, New York, New York.

Three possible approaches to reconstructing the paleoclimatic controls of the steppe-tundra environment are discussed. Simulations using general circulation models are shown to be of limited applicability at the present stage of model development. Synoptic and topoclimatic analogs based on present day conditions are rather more useful, but empirical estimates based on various proxy sources, combined with local energy budget (climatonomic) models, may provide the best approach at the present time.

The weight of evidence suggests a regime of cold, dry winters, especially in the interior valleys and in the vicinity of the modern Bering Strait and Chukchi Sea. Summers appear to have been drier and cooler than now, allowing more of the annual precipitation to fall as snow. Local topoclimatic differences may have been sufficient to provide a variety of habitats allowing a biotic mosaic to exist. However, caution is expressed in the tendency to equate general treelessness and herbaceous tundra with a particular type of "steppe climate." The dramatic late-glacial — early-postglacial biotic changes appear to reflect a more rapid vegetational response to climatic amelioration than occurred in Europe, presumably due to species availability.

Location: AEU SCI QE 720 W47, AEA PMA/ASA 560.45 P174
Area: Beringia
Topics: Climate history

Bombin, M., and K. Muehlenbachs

1985 $^{13}C/^{12}C$ Ratios of Pleistocene Mummified Remains from Beringia. Quaternary Research 23:123-129.

During the Quaternary glacial episodes, when sea level was considerably lower, Asia and North America were linked by large extensions of circumarctic land (Beringia), which remained unglaciated. This land mass served not only as a biogeographical bridge for plants, animals, and humans, but also supported a biome very different from present tundra or boreal coniferous forests, which was dominated by steppes and a rich mammalian megafauna. Carbon stable isotope ratios of Beringian late Pleistocene mummified remains of bison, equids, mammoth, caribou, musk-ox, moose, woolly rhino, and other undetermined species, found preserved in permafrost, indicate that these megaherbivores fed exclusively on C_3 plants, and that C_4 grasses were not differentially ingested by bison, as previously suggested. Paleoclimatic constraints probably prevented the formation of a warm-season (C_4) guild during the later part of the growing season in the steppes of Beringia during the last glaciation.

Location: AEU SCI QE 696 Q24
Area: Beringia
Topics: Beringian ecology, Beringian vegetation, Stable isotopes - carbon, Faunal remains

Critchfield, W. B.

1985 The Late Quaternary History of Lodgepole and Jack Pines. Canadian Journal of Forest Research 15:749-772.

Lodgepole and jack pines (*Pinus contorta* Dougl. ex. Loud. and *Pinus banksiana* Lamb.), components of the North American boreal forest, have pioneering roles after major disturbances such as fire or glaciation. These species are closely related and hybridize in western Canada, but their fossil records and contemporary variation patterns suggest they had completely different late Quaternary histories. Several taxonomically recognized geographic races of lodgepole pine apparently survived the last glaciation without drastic modification, the northern races either persisting in far-northern refugia or migrating from the south. The uneven influence of jack pine on northern lodgepole populations implies repeated genetic contacts, but less marked introgression in the other direction could be of post-Pleistocene origin. Jack pine occupied its entire range after the last glacial maximum and lacks taxonomically recognized races. In the Great Lakes region, however, the presence of regionally distinct populations suggests the species had at least two Midwestern refugia. This hypothesis is contrary to the widely held view that jack pine occupied most or all of its range from a well-

documented refugium in southeastern North America, but is supported by limited fossil evidence that pine persisted in the Midwest during the last glaciation.

Location: AEU SCI SD 145 C23
Area: Canada - western, Eastern Beringia
Topics: Review of pollen studies - Eastern Beringia, Plant taxomony, Plant migration, Biogeography - *Pinus*, Genetics - *Pinus*, Vegetation history - *Pinus*, Refugia

Fladmark, K. R.

1983 Times and Places: Environmental Correlates of Mid-to-Late Wisconsinan Human Population Expansion in North America. In *Early Man in the New World*, edited by R. Shutler Jr., pp. 13-41. Sage Publications, Beverly Hills, California.

Location: AEU HSS E 61 E12
Area: Eastern Beringia
Topics: Human migration, Refugia, Review of glacial history - Eastern Beringia, Review of vegetation history - Eastern Beringia, Climate history, Sea level changes, Ice-free corridor

Giterman, R. E., A. V. Sher, and J. V. Matthews Jr.

1982 Comparison of the Development of Tundra-Steppe Environment in West and East Beringia: Pollen and Macrofossil Evidence from Key Sections. In *Paleoecology of Beringia*, edited by D. M. Hopkins, J. V. Matthews Jr., C. E. Schweger and S. B. Young, pp. 43-73. Academic Press, New York, New York.

Pollen and macrofossils from several important exposures in the lower Kolyma basin of eastern Siberia and one in western Alaska record development of tundra-steppe in Beringia.

The Krestovka exposure near the Kolyma River contains sediments dating from late Pliocene to late Pleistocene. Its oldest unit, the Begunov Suite, formed in a forested environment. The overlying Kutuyakh beds are rich in mammalian fossils that, in concert with paleomagnetic data, suggest a late Pliocene age for most of the unit. The Kutuyakh interval was one of increase in abundance of herbs, but also of high percentages of *Artemesia*, *Selaginella sibirica*, and other xeric types indicative of steppe-like biocenoses that appear first in the overlying beds of the late Pliocene (early Pleistocene of North American usage) Olyor Suite.

A long time gap separates the Olyor sediments from the late Pleistocene and Holocene units capping the Krestovka exposure. Some details on the environment of this period are supplied by pollen spectra from the Utkinsky Kamen section.

At Krestovka, late Pleistocene spectra contain stone pine and other shrubs, as well as abundant herbs and *Selaginella sibirica*. This trend is best displayed in the thick Sartan (late Wisconsin) sequence of "ice complex" sediments at the Duvannyy Yar exposure, another important site on the Kolyma River. The Duvannyy Yar exposure also reveals that a period of enhanced abundance of shrubs (presumably due to milder climate) occurred during the Sartan. Fossils from unit II at Duvannyy Yar illustrate the difference between Sartan and Karginsk environments in eastern Siberia.

The Cape Deceit section in Alaska contains sediments ranging in age (in North American nomenclature) from at least early Pleistocene to late Pleistocene. The oldest unit, Cape Deceit Formation, is intermediate in age between the Olyor and Kutuyakh Suites in Siberia and represents tundra different from that of the present, but that contains few of the xeric (steppe?) indicators seen in the late Pleistocene unit (Deering Formation) or in other Wisconsin pollen sequences from East Beringia.

Fossils from various levels of the Deering Formation suggest existence of a tundra-steppe vegetation mosaic in East Beringia; however, the peak in development of steppe-like biocenoses may have occurred during the early Wisconsin and not the late Wisconsin as in eastern Siberia. There are other differences between the Siberian and Alaska-Yukon assemblages (e.g., *Selaginella sibirica* percentages, various groups of Coleoptera, large mammals) that caution against the conclusion that Beringia was characterized by a monolithic steppe biome during the late Pleistocene.

Location: AEU SCI QE 720 W47, AEA PMA/ASA 560.45 P174
Area: Alaska - western, Eastern Beringia, Siberia - northeastern, Western Beringia
Topics: Palynological sites - Imuruk Lake, Palynological sites - Cape Deceit, Review of pollen studies - Beringia, Review of vegetation history - Beringia, Insect macrofossils, Periglacial features,

Palaeomagnetism, Plant macrofossils - *Larix* cones, Plant macrofossils, Pollen analysis, Faunal remains, Beringian land bridge connection

Hibbert, D.

1982 History of the Steppe-Tundra Concept. In *Paleoecology of Beringia*, edited by D. M. Hopkins, J. V. Matthews Jr., C. E. Schweger and S. B. Young, pp. 153-156. Academic Press, New York, New York.

The study of loess sheets, mammal assemblages, and pollen spectra from deposits dating to the last continental glaciation in northern Eurasia led workers in the late 19th and early 20th centuries to the conclusion that climate over much of the region had been extremely continental during times of glacial maxima. Soviet palynologists and vertebrate paleontologists working in western Beringia and later their North American counterparts in eastern Beringia developed the concept of a former extensive grassy vegetation characterized by the presence of both tundra and steppe elements. This vegetation has no exact modern analogue, and was named tundra-steppe by Soviet workers (usually steppe-tundra in English). More recent work suggests that Beringia contained a variety of vegetation types in a strongly continental climate.

Location: AEU SCI QE 720 W47, AEA PMA/ASA 560.45 P174
Area: Beringia
Topics: Terminology, Vegetation history

Hopkins, D. M.

1972 The Paleogeography and Climatic History of Beringia During Late Cenozoic Time. Inter-Nord 12:121-150.

Beringia (Alaska, northeastern Siberia, and the intervening continental shelves) has played a strategic role in the evolution of northern biota during late Cenozoic time, because of its position athwart restrictions in both intercontinental and interhemispheric dispersal routes. Exposures of the extensive shelf areas during marine regressions and changes in water circulation across the shelf during transgressions have had dramatic effects upon the climate. A dichotomy between a maritime climate in the generally mountainous southern coastal fringe and a more continental climate in uplands and lowlands further north has been an enduring feature of Beringian history. But the continentality of the central and northern regions was greatly enhanced during intervals of low sea level, when Beringia was a single, broad landmass and when extensive ice caps in the coastal mountains blocked northward penetration of moist air masses. It is clear that the North Pacific Ocean and southern Bering Sea have been the persistent sources of moisture and that the Arctic Ocean, ice-free or not, failed to contribute importantly to precipitation in Beringia.

A temperate climate prevailed in Beringia until shortly before the beginning of the Pleistocene Epoch, although glaciation began in the mountains of Alaska and probably in the mountains of Kamchatka and the Koryak region some 10 m. y. ago. The effects of severe frost action are first recorded in lowland areas about 2.0 m.y. ago, and the earliest evidence of permafrost is in deposits about 1.0 $\pm$ 0. 5 m.y. old. Forest vegetation probably covered most of Beringia throughout the Pliocene Epoch; the tundra biome did not appear until near the beginning of the Pleistocene Epoch. The Arctic Ocean seems to have been either ice free or only seasonally icebound until well into Pleistocene time.

A series of progressively older «colder» interglacial marine transgressions culminated in the middle Pleistocene Kotzebuan Transgression, during which cold, Arctic water flowed southward through the Bering Strait. Glaciers may have been present in the mountains of Chukotka and northern Alaska, and this may have resulted in local changes in albedo sufficient to trigger subsequent growth of continental ice caps during the penultimate (Illinoian or Salle) glaciation. Paleoclimatic data are inadequate for a detailed reconstruction of the climate during the penultimate glaciation, but of the several episodes recorded in Beringia, this was the most extensive.

The last (Sangamon or Eem) interglaciation was a time of relatively mild climate during which spruce forest extended well north and west of the modern forest limit in Alaska, and birch woodlands became established in sheltered valleys in Chukotka. The distribution of fossil marine mollusks indicates that warm Pacific water entered southwestern Bering Sea and meandered northward to Bering Strait and thence into the Chukchi Sea. Winter sea ice probably was restricted to regions north of the strait. The last interglaciation was punctuated, however, by a marine regression during which the climate temporarily became more severe.

Climatic fluctuations during the early part of the last (Wisconsin or Warthe) glaciation are poorly understood, but this cold cycle culminated in a period of extremely severe climate between 13,000 and 20,000 years ago. Glaciers covered

the mountain rangers [sic] bordering the Pacific Ocean and southwestern Bering Sea, as well as large areas in the Brooks Range and the mountains of Chukotka. The climate of central and northern Beringia was strongly continental and very dry. Persistent barometric highs over the polar sea ice resulted in strong northeast winds in regions north of the Arctic Circle, and the ice fields of southern Alaska produced strong and persistent katabatic southwest winds in central Alaska. Tundra-steppe clothed most of unglaciated Beringia. Forest biota persisted only in a few unglaciated enclaves in Kamchatka and in a refugium on the continental shelf somewhere near the modern Yukon River Delta.

There is no clear record in Beringia of the dramatic climatic oscillations recorded in temperate latitudes between 13,000 and 10,000 years ago. Bering Strait was reopened as a sinuous, shallow seaway, when sea level rose to -38 meters about 13,000 or 14,000 years ago, and this brought a milder climate to western Alaska and probably also to Chukotka. However, the climate of central Alaska remained cold and dry. Evidence for strong northeast winds on the Pribilof Islands suggests that the persistent barometric high was now located over pack ice on the continental shelf of the Chukchi Sea.

A sharp vegetation change records a rapid warming throughout Beringia about 10,000 years ago. In most parts of Beringia, the Holocene warming seems to have peaked in a minor thermal maximum about 5,000 years ago, but northwestern Alaska has experienced two climatic optima - one within the interval 10,000 to 8,000 years ago and another during the last three decades - during which forest biota expanded to their furthest limits. These expansions of forest biota in northwestern Alaska seem to have taken place during intervals when summer weather was clear and warm, but the cause of this local summer warming remains obscure.

Location: AEU HSS HC 10 I625
Area: Beringia
Topics: Review of climate history - Beringia, Review of vegetation history - Beringia, Sea level changes, Review of glacial history - Beringia, Palaeowinds, Refugia, Beringian vegetation, Pollen records, Molluscs, Plant macrofossils, Periglacial features, Beringian land bridge connection

1979 Landscape and Climate of Beringia During Late Pleistocene and Holocene Time. In *The First Americans: Origins, Affinities, and Adaptations*, edited by W. S. Laughlin and A. B. Harper, pp. 15-41. Gustav Fischer, New York, New York.

Location: AEU HSS E 61 F52
Area: Beringia
Topics: Review of glacial history - Beringia, Review of climate history - Beringia, Sea level changes, Human migration, Palaeochannels, Beringian vegetation, Vegetation history, Beringian land bridge connection

Hopkins, D. M., F. S. MacNeil, R. L. Merklin, and O. M. Petrov
1965 Quaternary Correlations Across Bering Strait. Science 147:1107-1114.

Location: AEU SCI Q 1 S41
Area: Beringia
Topics: Beringian land bridge connection, Dating - uranium series, Palaeomagnetism, Sea level changes, Molluscs, Vegetation history, Pollen records

Hopkins, D. M., P. A. Smith, and J. V. Matthews Jr.
1981 Dated Wood from Alaska and the Yukon: Implications for Forest Refugia in Beringia. Quaternary Research 15:217-249.

Postulations on the existence of forest refugia in parts of Beringia during the last glacial have been, in large part, based on ambiguous evidence. Existing data on radiocarbon-dated and identified fossil wood and macrofossils from Alaska and northwest Canada are synthesized here and are augmented by results of palynological studies in an effort to show the persistence of some, and total extinction of other, tree and large shrub species. Possible dispersal routes taken by species that reinvaded Beringia in postglacial times are also reconstructed from the fossil record. Macrofossil and pollen evidence, when combined with climatic factors, makes cottonwood a good candidate for survival during the last glacial. Larch and aspen are also candidates, though the evidence for them is less positive. Pollen and macrofossils of alder are very scarce in deposits of the last glacial age, and if it survived at all, it was probably in very isolated vegetatively reproducing clones.

Shrub birch may have been present in Beringia, but tree birch probably was reintroduced during the Holocene. Spruce also appears to have been absent in Alaska from about 30,000 to 11,500 yr ago and probably reinvaded Beringia from a refugium south of the Laurentide ice sheet.

Location: AEU SCI QE 696 Q24
Area: Beringia
Topics: Refugia, Pollen records, Plant macrofossils, Vegetation history, Beringian vegetation, Plant migration, Dating - analysis of radiocarbon dates, Plant macrofossils - *Betula*, Plant macrofossils - *Larix*, Plant macrofossils - *Picea*, Plant macrofossils - *Populus*, Plant macrofossils - *Alnus*

Löve, A.

1959 Origin of the Arctic Flora. In *Problems of the Pleistocene and Arctic*, pp. 82-95. Publications of McGill University Museums, Number 1. Montreal, Québec.

Notes: Compiled by G. R. Lowther
Location: AEU SCI QE 741 P72
Topics: Biogeography, Refugia

Löve, D.

1962 Plants and Pleistocene. In *Problems of the Pleistocene*, pp. 17-39. Publications of McGill University Museums, Volume 2, Number 2. Montreal, Québec.

Notes: Compiled by G. R. Lowther
Location: AEU SCI QE 741 P72
Topics: Genetics - plants, Plant migration, Biogeography

Packer, J. G.

1978 Paleoecology of the Ice-Free Corridor. In *AMQUA, 5th Biennial Meeting, Edmonton, Alberta, Abstracts*, p. 38.

Location: AEU HSS QE 696 A5212
Area: Beringia
Topics: Beringian vegetation, Plant migration

1980 Paleoecology of the Ice-Free Corridor: The Phytogeographical Evidence. Canadian Journal of Anthropology 1(1):33-35.

Notes: See also "Paleoecology of the Ice-Free Corridor" by J. G. Packer (1978).
Location: AEU PMC GN 1 C22
Area: Beringia
Topics: Biogeography, Ice-free corridor, Plant migration, Beringian vegetation, Refugia

Webber, P. J.

1976 Northern Arid Grassland Ecosystems. In *AMQUA, 4th Biennial Meeting, Tempe, Arizona, Abstracts*, pp. 82-83.

Area: Alaska, Beringia
Topics: Terminology, Vegetation history

Wright Jr., H. E.

1971 Late Quaternary Vegetational History of North America. In *The Late Cenozoic Glacial Ages*, edited by K. K. Turekian, pp. 425-464. Yale University Press, New Haven, Connecticut.

Location: AEU SCI QE 690 L35
Area: Eastern Beringia
Topics: Review of vegetation history - North America, Palynological sites - Antifreeze Pond

Young, S. B.

1982 The Vegetation of Land-Bridge Beringia. In *Paleoecology of Beringia*, edited by D. M. Hopkins, J. V. Matthews Jr., C. E. Schweger and S. B. Young, pp. 179-191. Academic Press, New York, New York.

This paper offers a reconstruction of the vegetation of eastern Beringia during the last emergence of the Bering land bridge and traces the subsequent alterations in that vegetation. It is assumed that (1) the ancient vegetation was complex and variable over time and space, (2) it was not necessarily comparable to any modern boreal or arctic vegetation, and (3) data from a wide variety of sources are relevant. Evidence has been drawn from paleontological, phytogeographical, and ecological studies involving both plants and animals.

The reconstruction proposed here emphasizes a mosaic of vegetation types. Among the more significant are those adapted to mesic and arid situations, including a variety of woodland, brushland and steppe associations. Many of these probably do not have fully analogous modern counterparts; some of the plant species involved may no longer even occur in the area.

The reconstruction is compatible with the view that climate was colder than at present but also more continental, with comparatively warm summers over much of the area. It further suggests that the megafauna associated with Wisconsin Beringia could have inhabited the area continuously and in some numbers. In many areas the character of the vegetation was strongly affected by various types of natural disturbance. It is argued that the "birch rise" noted in many late Wisconsin pollen spectra is the result of catastrophic vegetation changes that were associated with the submergence of the land bridge and which destabilized the entire Beringian ecosystem.

Location: AEU SCI QE 720 W47, AEA PMA/ASA 560.45 P174
Area: Beringia
Topics: Beringian vegetation, Pollen records, Review of vegetation history - Beringia, Biogeography, Beringian land bridge connection

PART 4. LATE QUATERNARY PALAEONTOLOGY

Flerow, C. C.

1967 On the Origin of the Mammalian Fauna of Canada. In *The Bering Land Bridge*, edited by D. M. Hopkins, pp. 271-280. Stanford University Press, Stanford, California.

Notes: Based on a Symposium held at the VII Congress of the International Association for Quaternary Research (INQUA), Boulder, Colorado, 1965.
Location: AEU SCI QE 39 H79
Area: Beringia
Topics: Palaeontology, Faunal remains, Beringian land bridge connection

Garutt, W. E., A. Gentry, and A. M. Lister

1990 *Mammuthus* Brookes, 1828 (Mammalia, Proboscidea): Proposed Conservation, and *Elephas primigenius* Blumenbach, 1799 (Currently *Mammuthus primigenius*): Proposed Designation as the Type Species of *Mammuthus*, and Designation of a Neotype. The Bulletin of Zoological Nomenclature 47(1):38-44.

The purpose of this application is to conserve the generic name *Mammuthus* Brookes, 1828, and to designate *Elephas primigenius* Blumenbach, 1799 as the type species, in accordance with existing usage. *M. primigenius*, the woolly mammoth, is known from Pleistocene deposits in Europe, Asia and northern North America. A neotype for *primigenius* is designated.

Location: AEU SCI QL 353 I6
Topics: Nomenclature, Palaeontology, Faunal remains - *Mammuthus primigenius*

Graham, R. W.

1979 Paleoclimates and Late Pleistocene Faunal Provinces in North America. In *Pre-Llano Cultures of the Americas: Paradoxes and Possibilities*, edited by R. L. Humphrey and D. Stanford, pp. 49-69. The Anthropological Society of Washington, Washington, D.C.

Location: AEU HSS E 61 P92
Area: Eastern Beringia
Topics: Zoogeography, Faunal migration, Vegetation history, Beringian vegetation, Climate history, Faunal remains, Faunal extinction, Faunal associations

Guthrie, R. D.

1982 Mammals of the Mammoth Steppe as Paleoenvironmental Indicators. In *Paleoecology of Beringia*, edited by D. M. Hopkins, J. V. Matthews Jr., C. E. Schweger and S. B. Young, pp. 307-326. Academic Press, New York, New York.

The most puzzling feature of the mammoth steppe is its great diversity of large mammals. The reasons for their diversity, their dietary specializations and their gigantism are examined here, in conjunction with other information, as clues to an investigation of the general paleoenvironment.

The mammalian evidence suggests a specific vegetational mosaic with certain seasonal characteristics. Mammalian growth patterns indicate a long growing season, requiring diets high in available energy and nutrients. These features would require a seasonally rich Pleistocene vegetation in comparatively fertile soil that utilizes antiherbivory defenses quite different from those used by the dominant plant forms now present in the North.

The annual seasonal cycle reconstructed here is characterized by cold, but perhaps variable, winters with very little snowfall. Most of the annual moisture would have fallen during spring and little to none during summer. Summer soils generally were warm, dry, and had a deep thaw. This intraannual variability in the growth season produced hydric, mesic, and xeric plants within the same local communities. Windy conditions were most common.

A new model is presented to explain the high species diversity of Pleistocene mammals, their large social organs and gigantism, as well as the converse: Holocene dwarfing, shrinking social organs, range contractions and extinction with the demise of the mammoth steppe.

Location: AEU SCI QE 720 W47, AEA PMA/ASA 560.45 P174
Area: Eastern Beringia, Western Beringia
Topics: Megafauna, Beringian ecology, Faunal extinction, Zoogeography

1986 Environmental Influences on Body Size, Social Organs, Population Parameters and Extinction of Beringian Mammals. Translated by R. Chakravarty. In *Beringia in the Cenozoic Era*, edited by V. L. Kontrimavichus, pp. 389-421. Russian Translation Series No. 28. A. A. Balkema, Rotterdam, The Netherlands.

The author proposes that the variations in the "seasonality" pattern influence mammalian body size, the degree of development of social organs, reproduction rate, density, and a number of other life history features. The seasonal bottleneck largely controls density or quantity, and the luxuriance of the growth season largely controls individual condition or quality. The interaction of these two factors greatly influences many other characters. The more extreme the divergence from the annual mean "hospitability" the lower the quantity and the higher the quality with regard to many characteristics. Populations occupying an area with very little seasonal variation are of higher quantity and lower quality. This principle is true both developmentally and genetically.

Evidence suggests that the Pleistocene tundra-steppes represented an unparalleled extreme in high-quality mammalian populations. Most species were larger in body size and had better-developed social organs than their counterparts elsewhere.

The mammals of the tundra-steppe which spread throughout the north from Western Europe to northwestern Canada reveal interesting aspects of the environment of the past, the forces that controlled their body size and social organs, and the nature of their own extinction.

Notes: Translation of *Beringiya v Kainozoe*. Vladivostok, 1976. Collection of papers presented at the All-Union Symposium "The Bering Land Bridge and its Role in the History of Holarctic Floras and Faunas in the Late Cenozoic" held at Khabarovsk in May, 1973.
Location: AEU POLAR 56:(*3) KON
Area: Beringia
Topics: Beringian vegetation, Beringian ecology, Megafauna, Faunal extinction, Faunal remains, Zoogeography

1990 *Frozen Fauna of the Mammoth Steppe*. University of Chicago Press, Chicago, Illinois. 323 pp.

Location: AEU POLAR 599.735.5:(*493) GUT, EPL 569.73 GUT
Area: Alaska, Eastern Beringia, Siberia, Western Beringia
Topics: Faunal remains, Palaeontology, Taphonomy, Palaeontological sites - Alaska, Palaeontological sites - Siberia, Zoogeography, Faunal migration, Stratigraphy, Beringian ecology, Faunal extinction, Megafauna, Faunal remains - *Bison*

1990 Late Pleistocene Faunal Revolution - A New Perspective on the Extinction Debate. In *Megafauna and Man: Discovery of America's Heartland*, edited by L. D. Agenbroad, J. I. Mead and L. W. Nelson, pp. 42-53. Scientific Papers Volume 1. The Mammoth Site of Hot Springs, South Dakota, Inc. and Northern Arizona University, Hot Springs, South Dakota and Flagstaff, Arizona.

Paleontological sites record an episode of extraordinary faunal events at the Pleistocene-Holocene boundary. Our recent focus on large mammal extinctions has tended to obscure other features of this period, which was marked by rapid evolutionary change, fractionation of biotic communities, and enormous reductions in distributional ranges. I refer to these events collectively as the Late Pleistocene faunal revolution because fauna on every continent experienced acute change unparalleled in the last 400,000 years, and I argue this revolution was driven by climatic and vegetational change.

This paper examines the impact of the faunal revolution on late Pleistocene mammals of the Eurasian mammoth steppe and their cousins on the American Great Plains. These complex mammalian communities with extensive Pleistocene ties

became even more closely related when a large "tail" of the mammoth steppe biome was pinched off during the last glacial and drawn into the northern Great Plains.

Improper systematic delineation of Pleistocene large mammal taxa has led us to mistake range reductions and rapid evolutionary changes for extinctions, thus inflating the extinction tally. Although other organisms such as insects and plants suffered few extinctions, they experienced extreme distributional and community changes just as the large mammals did. By setting extinctions aside, the extent of these ecologically driven faunal events during the Late Pleistocene becomes strikingly apparent.

Location: AEU HSS QE 745 M496
Area: Western Beringia, Eastern Beringia
Topics: Megafauna, Faunal extinction, Faunal remains, Faunal associations, Beringian environment, Faunal migration, Zoogeography

Harington, C. R.

1980 Faunal Exchanges between Siberia and North America: Evidence from Quaternary Land Mammal Remains in Siberia, Alaska and the Yukon Territory. Canadian Journal of Anthropology 1(1): 45–49.

Location: AEU PMC GN 1 C22
Area: Eastern Beringia, Western Beringia
Topics: Faunal migration, Palaeontological sites - Cape Deceit, Palaeontological sites - Eastern Beringia, Palaeontological sites - Western Beringia, Palaeontological sites - Old Crow, Faunal remains, Zoogeography, Beringian environment

Haynes, G.

1991 *Mammoths, Mastodonts, and Elephants: Biology, Behavior, and the Fossil Record.* Cambridge University Press, Cambridge, England. xi + 413 pp.

Area: Beringia, North America
Topics: Faunal remains - *Mammuthus*, Faunal remains - *Mammut*, Palaeontology, Palaeontological sites - Beringia, Zoogeography - *Mammuthus*, Zoogeography - *Mammut*, Taphonomy, Bone modification, Nomenclature, Zoogeography - *Elephas*, Zoogeography - *Loxodonta*

Hoffmann, R. S.

1980 Of Mice and Men: Beringian Dispersal and the Ice-Free Corridor. Canadian Journal of Anthropology 1(1):51-52.

Location: AEU PMC GN 1 C22
Area: Beringia
Topics: Faunal migration, Zoogeography - microtine rodents, Human migration, Faunal associations, Beringian environment, Ice-free corridor

1986 An Ecological and Zoogeographical Analysis of Animal Migration Across the Bering Land Bridge During the Quaternary Period. Translated by R. Chakravarty. In *Beringia in the Cenozoic Era*, edited by V. L. Kontrimavichus, pp. 464-481. Russian Translation Series No. 28. A. A. Balkema, Rotterdam, The Netherlands.

In recent decades paleontologists like Simpson, Repenning, Flerov and Kurtén have considered Pleistocene migrations of mammals across the Bering Land Bridge. The present paper examines this topic from the ecological and zoogeographical viewpoints. Recent North American mammals may be grouped according to major ecological communities; tundra, taiga, deciduous forest, steppe, desert and alpine. The proportion of species and superspecies having Holarctic distribution is very high among tundra mammals and birds; somewhat lower taiga and alpine species, and very

small for the rest. Moreover, the degree of taxonomic affinity is highest for tundra species and somewhat less for taiga and alpine forms. Steppe and desert taxa of the Nearctic and Palearctic are related at the subgeneric or "species-group" level, and deciduous forest forms show questionable taxonomic affinities. The ecological and zoogeographic data support the following conclusions: 1) the environment of the Bering Land Bridge was tundra or cold steppe in the Late Pleistocene, taiga (in part) in the Middle or Early Pleistocene, and steppe (in part) in the Early Pleistocene or Late Pliocene; 2) isolating barriers between the Nearctic and Palearctic were competitive as well as ecological and physical; 3) there is a correlation between time of isolation in the Bering area, and degree of phenetic difference in related Holarctic populations, which may permit estimates of the rate of evolution in various mammalian and avian lineages.

Notes: Translation of *Beringiya v Kainozoe*. Vladivostok, 1976. Collection of papers presented at the All-Union Symposium "The Bering Land Bridge and its Role in the History of Holarctic Floras and Faunas in the Late Cenozoic" held at Khabarovsk in May, 1973.
Location: AEU POLAR 56:(*3) KON
Area: Eastern Beringia, Western Beringia
Topics: Zoogeography, Faunal migration, Beringian vegetation, Faunal associations

Janossy, D.

1986 Some New Data on Faunal Exchange Across the Bering Land Bridge. Translated by R. Chakravarty. In *Beringia in the Cenozoic Era*, edited by V. L. Kontrimavichus, pp. 359-366. Russian Translation Series No. 28. A. A. Balkema, Rotterdam, The Netherlands.

The author compares some Eurasian and North American gallinaceous birds and small mammals on the basis of osteological, paleontological considerations.

From this point of view, among the smaller Tetraonids, unambiguously of North American origin, the reinvasion by members of the genus *Lagopus* may be conceived as two waves, similar to that of man. New paleontological finds originating from Middle Europe speak of the Eurasiatic origin of Hazel grouse (members of the genera *Tetrastes* and *Bonasa*). The close relation of the Eastern Asiatic and North American spruce grouse (*Falcipennis* and *Canachites*) is proved by a detailed osteological comparison.

Some newly found remains of the members of the small mammal family Eomyidae, especially *Leptodontomys*, in Europe show great similarity with North American forms.

Finally the odontological features of the Eurasian and North American sagebrush voles (*Lagurus*) are compared, showing peculiar specialization.

Notes: Translation of *Beringiya v Kainozoe*. Vladivostok, 1976. Collection of papers presented at the All-Union Symposium "The Bering Land Bridge and its Role in the History of Holarctic Floras and Faunas in the Late Cenozoic" held at Khabarovsk in May, 1973.
Location: AEU POLAR 56:(*3) KON
Area: Western Beringia, Eastern Beringia
Topics: Faunal migration, Zoogeography, Palaeontology, Faunal remains

Johnson, P. H., C. B. Olson, and M. Goodman

1985 Prospects for the Molecular Biological Reconstruction of the Woolly Mammoth's Evolutionary History: Isolation and Characterization of Deoxyribonucleic Acid from the Tissue of *Mammuthus primigenius*. Acta Zoologica Fennica 170:225-231.

Deoxyribonucleic acid (DNA) was isolated from tissue samples of Yuribei, Magadan, and Khatanga mammoth specimens, radiocarbon dated between 10 000 and 53 000 years old. The isolation procedure involved homogenization of tissue in low-ionic-strength buffer, repeated cycles of reaction with proteinase k in 0.5 % sodium dodecyl sulfate, and phenol extraction followed by thermal chromatography on hydroxyapatite (HAP).

The presence of deoxyribonuclease-sensitive material that migrated as a heterogeneous population of fragments ranging in size from 3000 to 200 base pairs was demonstrated by agarose gel electrophoresis. Ultraviolet (UV) spectroscopy prior to HAP chromatography showed that the nucleic acid fractions had anomalous UV spectra, characterized by a local maximum at 260 nm, but unusually high relative absorption at 230 nm, 280 nm, and visible wavelengths compared with purified DNA from the Asian elephant (*Elephas maximus*), a close living relative of the mammoth. Two distinct nuclei

acid fractions were separated by HAP chromatography at 60°C in 0.12 M phosphate buffer (PB). Approximately 70 % of the material did not bind HAP under these conditions. The remaining fraction was eluted by 0.5 M PB and had a UV spectrum more typical of uncontaminated DNA. Thermal denaturation analysis of purified mammoth DNAs showed a broad asymmetric profile characeristic of the helix-to-coil transition of double-stranded DNA fragments containing substantial base compositional heterogeneity. Seventy-five percent of the DNA showed a melting transition corresponding to 50 to 62 mole % guanine plus cytosine (G+C); less than 25 % of the DNA had a base composition similar to Asian elephant DNA calculated as 36 % G+C. Mammoth DNA preparations were found to be substrates for *E. coli* DNA polymerase I in an *in vitro* DNA synthesis reaction and resulted in the incorporation of radioactive nucleotides to give labeled DNAs of high specific activity. Preliminary analysis by nucleic acid hybridization indicated that only a small fraction of DNA isolated from mammoth tissue was homologous to DNA of Asian elephant, agreeing qualitatively with the results of the thermal denaturation analysis. The remaining DNA may be the result of microbial contamination from the distant past.

Our results provide the first definitive isolation and characterization of DNA from ancient tissue, and suggest a purification strategy that will lead to mammoth DNA preparations significantly enriched in elephant-related DNA sequences. The application of molecular cloning techniques should make possible a variety of important molecular genetic and evolutionary studies of this extinct mammal.

Location: AEU POLAR 05 A188
Topics: Genetics - *Mammuthus*, Faunal remains - *Mammuthus primigenius*

Kalke, H. D.

1986 Southern Limits of the Late Pleistocene Euro-Siberian Faunal Complex in East Asia. Translated by R. Chakravarty. In *Beringia in the Cenozoic Era*, edited by V. L. Kontrimavichus, pp. 346-358. Russian Translation Series No. 28. A. A. Balkema, Rotterdam, The Netherlands.

Many new findings of animal remains, representatives of the Late Pleistocene Euro-Siberian faunal complex, have been made over the past 15 years. The author lists the southernmost and southeasternmost sites of such animals as the mammoth, the woolly rhinoceros, the giant deer, the elk, the Asiatic wild ass, the Przewalkii horse and the prehistoric bison.

The geographic positions of those sites indicate that in the Late Pleistocene the Euro-Siberian faunal complex was distributed in East Asia from Japan and Korea to Hebei Province in China, and in the south to northeast Sychuan.

During the last Wurm glaciation the range of distribution expanded not only to the north, where typical mammal representatives crossed the Bering Land Bridge, but also to the south and southeast. When migrating across the Tatar Land Bridge to Sakhalin, Hokkaido and other islands, the animals, to a certain extent, drove out the representatives of the Sino-Malayan fauna inhabiting the region since the Middle Pleistocene.

Notes: Translation of *Beringiya v Kainozoe*. Vladivostok, 1976. Collection of papers presented at the All-Union Symposium "The Bering Land Bridge and its Role in the History of Holarctic Floras and Faunas in the Late Cenozoic" held at Khabarovsk in May, 1973.
Location: AEU POLAR 56:(*3) KON
Area: Siberia, Western Beringia, China - northeastern, Japan
Topics: Palaeontological sites - Siberia, Palaeontological sites - China - northeastern, Palaeontological sites - Japan, Faunal remains - *Mammonteus primigenius*, Faunal remains - *Coelodonta antiquitatis*, Faunal remains - *Megaloceros ordosianus*, Faunal remains - *Alces alces*, Faunal remains - *Equus hemionus*, Faunal remains - *Equus przewalskii*, Faunal remains - *Bison priscus*, Faunal associations, Faunal migration, Zoogeography

Kishchinskii, A. A.

1986 Basic Elements of Mountain Faunas of North-East Siberia and North-West America and Stage of Formation thereof (Based on Data of Biogeographic Analysis). Translated by R. Chakravarty. In *Beringia in the Cenozoic Era*, edited by V. L. Kontrimavichus, pp. 482-491. Russian Translation Series No. 28. A. A. Balkema, Rotterdam, The Netherlands.

The paper outlines the biogeographic principles involved in the study of the evolution of faunas. Basic zoogeographic elements of mountain faunas in northeastern Siberia and northwestern North America are distinguished. A general picture of the evolution of the faunas has been hypothesized on the basis of the probable development of each species. At the end of the Pliocene, ancient Beringian taxa evolved in the mountains bordering the North Pacific within the common Asian-American range. These were ancestors of *Histrionicus*, *Heteroscelus*, *Cinclus pallasii*, *C. mexicanus*, *Lagopus*, *Aphriza*, *Calidris tenuirostris*, and also of some dendrophilous forms. In the Early Quateranry [sic], ancient *Ovis* (*Pachyceros*) *Ochontona* (*Pika*), *Urocitellus*, *Eremophila*, *Marmota*, etc. invaded Beringia, moving from inner Asia along steppe and mountain-steppe habitats. Ancestral *Leucosticte* and *Anthus spinoletta* did the same across alpine rocky meadows. In the Late Pleistocene a vast common area of alpine evolution developed in the northeastern Asia and Alaska. Recent species of sheep, marmots, pikas, as well as *Heteroscelus brevipes*, *H. incanus*, *Citellus parryi*, *Anthus* (*spinoletta*) *rubescens*, the northern group of crested lark races and the "curilica" and "tephrocotis" groups of *Leucosticte arctoa* evolved there. In North America, to the south of the Cordilleran ice sheet, mountain faunas developed independently. Subalpine faunas in northeastern Siberia began to form by the end of the Pleistocene, and in northwestern America perhaps only in the Holocene, when the present-day ranges formed and recent subspecies and the "youngest" species evolved.

Notes: Translation of *Beringiya v Kainozoe*. Vladivostok, 1976. Collection of papers presented at the All-Union Symposium "The Bering Land Bridge and its Role in the History of Holarctic Floras and Faunas in the Late Cenozoic" held at Khabarovsk in May, 1973.
Location: AEU POLAR 56:(*3) KON
Area: Western Beringia, Eastern Beringia
Topics: Zoogeography, Faunal remains, Glacial history

Kubiak, H.

1982 Morphological Characters of the Mammoth: An Adaptation to the Arctic-Steppe Environment. In *Paleoecology of Beringia*, edited by D. M. Hopkins, J. V. Matthews Jr., C. E. Schweger and S. B. Young, pp. 281-289. Academic Press, New York, New York.

This article deals exclusively with the morphological characteristics of the mammoth. A detailed summary is given of the present knowledge of mammoth features which could result from adaptation to the arctic steppe environment. Some morphological characteristics, among them, for example, the fat hump, the flap at the tail base, etc., are critically discussed, although these features are not assumed to be adaptive. However, most of the mammoth features analyzed here are adaptive and indicate: l) Protection against the cold air and wind from the double-coated fur (long outer hair and thick underwool) covering the whole body, including the trunk, ears, tail, and limbs, and from the thick layer of subcutaneous fat. 2) Prevention of the loss of body heat by small ears entirely covered with hair. 3) The ability of the mammoth to deal with tundra vegetation due to its relatively long body and short limbs; the special structure of the tip of its trunk, high molars and great number of dental plates; and enlarged twisted tusks. 4) Its advantage in marshy summer pastures because of its broad feet and relatively small body size (compared with that of the mammoth's ancestors).

Another important subject mentioned is the role of physiological mechanisms, which undoubtedly were also significant in the adaptation of the woolly mammoth to the cold climate.

Location: AEU SCI QE 720 W47
Area: Beringia
Topics: Faunal remains - *Mammuthus primigenius*, Palaeontological sites - Western Beringia, Megafauna, Beringian ecology

Kurentsov, A. I.

1986 Significance of Beringian Links in Holarctic Insect Zoogeography. Translated by R. Chakravarty. In *Beringia in the Cenozoic Era*, edited by V. L. Kontrimavichus, pp. 529-536. Russian Translation Series No. 28. A. A. Balkema, Rotterdam, The Netherlands.

A study of the geographic ranges of certain Holarctic, genetically related genera and species of insects confirms the periodic existence of the Bering Land Bridge during the Tertiary and Quaternary periods. The bridge was the route for faunal exchanges between East Siberia and North America.

Generally, the older East Siberian genera, e.g. Grylloblattina and Cryptocercus and the species *Rosalia coelestis*, distributed in Sikhote Alin, have vicariating representatives in North America. This indicates remoter (Tertiary) relationships between the faunas of the Old and New worlds, when the zone of mixed and broad-leaved forests reached Chukotka and Alaska. Later (Quaternary) faunal relationships between the two continents apparently existed at least three times. Genetically related species encountered along the east (*Anthocharis centhura*) and west (*A. belia*) sides of the Bering Sea serve as evidence of Beringian relationships in the Early Pleistocene. On the other hand, recent finds of such closely related subspecies on both Alaska (*Brenthis alberta alberta*) and Chukotka (*B. a. kurentzovi*) shows that they appeared in Beringia allopatrically (in the Late Pleistocene) as a result of marine regressions.

The detection of certain butterfly sub-species, e.g. *Colias palaeno chippewa* in Chukotka and Alaska, shows that they had separated recently (in the Holocene) and, without having experienced lengthy isolation, retain their morphological stability.

Notes: Translation of *Beringiya v Kainozoe*. Vladivostok, 1976. Collection of papers presented at the All-Union Symposium "The Bering Land Bridge and its Role in the History of Holarctic Floras and Faunas in the Late Cenozoic" held at Khabarovsk in May, 1973.
Location: AEU POLAR 56:(*3) KON
Area: Western Beringia, Eastern Beringia
Topics: Zoogeography - insects, Insect macrofossils

Kurtén, B.

1968 *Pleistocene Mammals of Europe*. Aldine Publishing Company, Chicago, Illinois. viii + 317 pp.

Notes: Contains references to European species also occurring in Northeast Asia and China.
Location: AEU SCI QE 881 K96, EPL 569.094 KUR
Area: Western Beringia, China
Topics: Palaeontology, Zoogeography, Faunal remains, Faunal extinction, Faunal associations

1986 Trans-Beringian Carnivore Populations in the Pleistocene. Translated by R. Chakravarty. In *Beringia in the Cenozoic Era*, edited by V. L. Kontrimavichus, pp. 339-345. Russian Translation Series No. 28. A. A. Balkema, Rotterdam, The Netherlands.

In four carnivore families, up to 15 instances of possibly circumpolar populations are found in the Pleistocene and Holocene. Three episodes of intense intermigration can be distinguished: early Blanko, late Blanko and the transition Irvingtonian-Rancholabrian.

Notes: Translation of *Beringiya v Kainozoe*. Vladivostok, 1976. Collection of papers presented at the All-Union Symposium "The Bering Land Bridge and its Role in the History of Holarctic Floras and Faunas in the Late Cenozoic" held at Khabarovsk in May, 1973.
Location: AEU POLAR 56:(*3) KON
Topics: Palaeontology, Faunal migration, Zoogeography, Faunal remains, Faunal associations

Lowenstein, J. M.

1985 Radioimmune Assay of Mammoth Tissue. Acta Zoologica Fennica 170:233-235.

Albumin and collagen have been identified by radioimmunoassay in the soft tissues of three Siberian mammoths - Yuribey, Dima and Khatanga. Detailed comparison of mammoth albumin with that of extant Indian and African elephants show them all to be about 99 % identical and genetically approximately equidistant from each other. These results are consistent with divergence of the three species about three to five million years ago. Although most of the mammoth albumin has undergone chemical change, as shown by sephadex column separations, it gives highly specific reactions with antibody made against elephant albumin. Mammoth tissue injected into rabbits and chickens evoked antisera which bind specifically with elephant proteins. The radioimmunoassay technique makes it possible to do molecular systematic analysis of fossil proteins.

Location: AEU POLAR 05 A188
Topics: Genetics - *Mammuthus*, Faunal remains - *Mammuthus primigenius*

Olsen, S. J., and J. W. Olsen
1977 The Chinese Wolf, Ancestor of New World Dogs. Science 197:533-535.

Location: AEU SCI Q 1 S41
Topics: Palaeontology, Faunal migration, Zoogeography - *Canis*, Archaeological sites - China, Archaeological sites - Zhoukoudian, Archaeological sites - Afontova Gora, Faunal remains - *Canis*

Repenning, C. A.
1967 Palearctic-Nearctic Mammalian Dispersal in the Late Cenozoic. In *The Bering Land Bridge*, edited by D. M. Hopkins, pp. 288-311. Stanford University Press, Stanford, California.

Notes: Based on a Symposium held at the VII Congress of the International Association for Quaternary Research (INQUA), Boulder, Colorado, 1965.
Location: AEU SCI QE 39 H79
Area: Beringia
Topics: Faunal migration, Faunal associations, Review of palaeontology, Faunal remains, Palaeontology

1980 Faunal Exchanges between Siberia and North America. Canadian Journal of Anthropology 1(1):37-44.

The microtine rodents, because of their rapid rate of evolution in recent geologic time, their arctic to temperate preferences, and their rapid rate of dispersal in appropriate environments, provide the most precise record of faunal movement between Siberia and North America. This record has been calibrated by radiometric dates, the paleomagnetic polarity scale, oceanic climatic indicators, and the similar history of microtine invasions from Siberia into Europe. The development of provincialism in the North American fossil microtine fauna clearly documents the effective beginning of the ice-free corridor east of the Cordilleran ice sheet. Between microtine dispersal events, Beringian Alaska had a Siberian fossil fauna bearing no relation to that of North America.

Location: AEU PMC GN 1 C22
Area: Eastern Beringia, Western Beringia
Topics: Faunal remains - microtine rodents, Faunal migration, Zoogeography - microtine rodents, Palaeontological sites - Cape Deceit, Palaeontology, Faunal associations

1984 Quaternary Rodent Biochronology and its Correlation with Climatic and Magnetic Stratigraphies. In *Correlation of Quaternary Chronologies*, edited by W. C. Mahaney, pp. 105-118. Geo Books, Norwich, England.

Accumulation of a functional data base of K/Ar ages, dating of paleomagnetic stratigraphy, and development of a 'climatic' stratigraphy based upon oxygen-isotope ratios in oceanic sediments have provided a supplement to stratigraphic superposition that is applicable throughout the world. These enable, for the first time, biochronologic reconstruction of the evolution of rapidly evolving mammals which, in turn, provides a basis for worldwide correlation of Pleistocene events. First to be reconstructed, the biochronology of the microtine rodents provides a nearly complete correlation of Pleistocene events throughout most of Holarctica from the beginning of the Pleistocene essentially to the oldest of ^{14}C dates. The primary biochronologic controls throughout Holarctica are brief periods of rapidly spreading microtine faunas, referred to as dispersal events. They apparently occurred near the ends of episodes of most extensive grasslands and are believed to be dated with 25 000 years possible error on the basis of present evidence.

Location: AEU SCI QE 696 C82
Area: Western Beringia, Eastern Beringia

Topics: Zoogeography - microtine rodents, Palaeontological sites - Western Beringia, Palaeontological sites - Eastern Beringia, Faunal remains - microtine rodents, Faunal migration, Dating - K/Ar, Faunal associations

1985 Pleistocene Mammalian Faunas: Climate and Evolution. Acta Zoologica Fennica 170:173-176.

Beginning just before the Pleistocene, climatic fluctuations throughout Holarctica began to increase in intensity. This caused the development of strong latitudinal zonation in the mammalian fauna of the world and accelerated speciation in those more northerly land masses with greatest longitudinal extent. Accelerated speciation, centering primarily in the faunal province of Siberia and North American Beringia, rapidly changed the mammalian fauna and these newly-evolved faunas dispersed southward with each major cold spell into more temperate lands. The dispersal of this Pleistocene fauna was inhibited by a variety of ecologic barriers, intensified by the developing latitudinal zonality. Low-latitude north-south environmental avenues were greatly limited and there seems to have been very little exchange between North and South America. More, but still limited, invasion of Africa occurred during three maximum glaciations. The records of India indicate a similar history for this subcontinent but data are still insufficient to document it. North America, south of Beringia, experienced only four immigration waves and extensive ice barriers possibly prevented other immigrations. In Europe, with broader Siberian and less extensive ice barriers, eight invasions may be recorded during the Pleistocene. These events can be correlated with new precision because of the development of paleomagnetic and paleoclimatic stratigraphies.

Location: AEU POLAR 05 A188
Area: Western Beringia, Eastern Beringia
Topics: Faunal migration, Zoogeography, Climate history, Palaeontology, Faunal associations

1989 Arctic Microtine Biochronology - Current Status. In *Late Cenozoic History of the Interior Basins of Alaska and the Yukon*, edited by L. D. Carter, T. D. Hamilton and J. P. Galloway, pp. 99-102. Circular 1026. United States Geological Survey.

Location: AEU SCI QE 75 C57
Area: Eastern Beringia
Topics: Faunal remains - microtine rodents, Palaeontological sites - Western Beringia, Palaeontological sites - Eastern Beringia, Palaeontological sites - Old Crow, Palaeontological sites - Cape Deceit, Zoogeography - microtine rodents, Palaeontology, Faunal migration

Russell, L. S.

1962 Mammalian Migrations in the Pleistocene. In *Problems of the Pleistocene and Arctic*, pp. 48-55. Publications of McGill University Museums, Volume 2, Number 2. Montreal, Québec.

Mammalian migrations in Pleistocene time followed two major paths, east-west, between Europe, Asia and North America, and north-south, between North and South America. The Bering isthmus must have been in existence a number of times, and for long intervals, during the epoch. A subsidiary exchange took place between Africa and southern Asia. Superimposed on these major trends were the movements brought about by the glacial cycles, alternately driving the tundra faunas southward and allowing the temperate-zone faunas to spread northward. Although much remains to be learned, especially in the field of local succession, the Pleistocene record of mammalian movement is unique, not only in being the best recorded, but in providing the key to the distribution of mammals in the world today.

Notes: Compiled by G. R. Lowther. Summary used as abstract.
Location: AEU SCI QE 741 P72
Topics: Faunal migration, Faunal extinction, Zoogeography, Faunal associations

Savage, D. E., and D. E. Russell

1983 *Mammalian Paleofaunas of the World*. Addison-Wesley Publishing Co., Reading, Massachusetts. 432 pp.

Notes: General palaeontology reference with broad temporal and geographic coverage. See especially Chapter 8: "Pleistocene mammalian faunas" (pp. 375-400).
Location: AEU SCI QE 881 S26
Topics: Palaeontology, Faunal remains, Zoogeography, Faunal associations

Schweger, C., and J. Martin

1976 Grazing Strategies of the Pleistocene Steppe-Tundra Fauna. In *AMQUA, 4th Biennial Meeting, Tempe, Arizona, Abstracts*, p. 157.

Area: Beringia
Topics: Beringian vegetation, Megafauna

Sher, A. V.

1986 The Role of Beringian Land in the Development of Holarctic Mammalian Fauna in the Late Cenozoic. Translated by R. Chakravarty. In *Beringia in the Cenozoic Era*, edited by V. L. Kontrimavichus, pp. 296-316. Russian Translation Series No. 28. A. A. Balkema, Rotterdam, The Netherlands.

Comparative study of Old and New World living and fossil mammals is a traditional source of information on the Beringian interrelations of the Holarctic faunas. But in recent times paleontological evidence directly from the area of exchange, i.e. from the Far North-East of the USSR and from Alaska, is especially important. The first Early and Middle Pleistocene mammalian localities have been discovered here recently, the first Late Pliocene finds have been made, and the studies in the paleogeography of this area show remarkable progress. But correlation of mammal-bearing deposits with the marine sequence of the Bering Strait zone making the stages of disruption of the land connection is rather difficult due to the different tectonic and paleogeographic history of this zone and the rest of the region of continental shelf and the peripherical lowlands of the Arctic coasts of Asia and North America. This vast region that had the major role in the history of Beringian faunal exchange, it is proposed to name Beringida. The narrow active zone of Beringida within which the land bridge and the strait alternately appeared we name Beringia.

The main stages of faunal evolution in Beringida are discussed - Middle-Late Pleistocene, Early Pleistocene and Late Pliocene. Present evidence suggests that during the Late Cenozoic the fauna of Beringida (including Alaska) developed as one. The stages of disruption of the land connection in the narrow zone of Beringia had a relatively minor role in the history of this fauna. The early development of cooling in the high latitudes caused the evolution of subarctic mammalian fauna in Beringida. Since the Early Pleistocene this fauna can be considered as cryoxerotic ("periglacial"). Due to the progressive general cooling of the Holarctic climate the cold-resistant Beringidan species had the opportunity of dispersal to the temperate latitudes of both continents.

Recent data support A. Turgarin's idea of the autochthonous evolution of the cold-resistant ("Arctic") fauna within Beringida. During the Late Cenozoic we must consider Beringida not as a land bridge across which an intercontinental faunal exchange took place, but as an independent (though closely related to the Palearctic) region in which a peculiar fauna evolved that repeatedly dispersed into the Old and New worlds.

Notes: Translation of *Beringiya v Kainozoe*. Vladivostok, 1976. Collection of papers presented at the All-Union Symposium "The Bering Land Bridge and its Role in the History of Holarctic Floras and Faunas in the Late Cenozoic" held at Khabarovsk in May, 1973.
Location: AEU POLAR 56:(*3) KON
Area: Beringia
Topics: Zoogeography, Faunal migration, Sea level changes, Climate history, Beringian vegetation, Periglacial features, Faunal associations, Palaeontological sites

Shoshani, J., D. A. Walz, M. Goodman, J. M. Lowenstein, and W. Prychodko

1985 Protein and Anatomical Evidence of the Phylogenetic Position of *Mammuthus primigenius* within the Elephantinae. Acta Zoologica Fennica 170:237-240.

The classical dental-based hypothesis states that among the Elephantinae, *Mammuthus* and *Elephas* are more closely related to each other than either of them to *Loxodonta*. This and alternative hypotheses were tested using morphological and immunochemical approaches. A total of 251 non-dental osteological characters was examined on 49 specimens of *Mammuthus primigenius*, *Elephas maximus*, *Loxodonta africana*, and *Mammut americanum*. *Mammut* was employed as an outgroup taxon. Results from maximum parsimony analysis on the osteological characters are congruent with the classical hypothesis. Evolutionary rates show that *Loxodonta* is the most conservative among the three Elephantidae studied. Muscle tissue extracts from all three Elephantidae genera and ground bone extracts of *Mammut* and *Loxodonta* were used in the immunological comparisons. Amino acid analysis of extracts from three mammoths (Magadan, Yuribey, and Khatanga) and one mastodon detected significant quantities of hydroxyproline and hydroxylysine. Results with rabbit and chicken antisera against *Elephas* albumin, *Elephas* muscle homogenate and *Mammuthus* tissue extracts show close relationship of *Mammuthus* to *Elephas* and *Loxodonta*.

Location: AEU POLAR 05 A188
Topics: Genetics - *Mammuthus*, Faunal remains - *Mammuthus primigenius*

Stafford Jr., T. W.

1988 Accelerator ^{14}C Dating of Late Pleistocene Megafauna. Current Research in the Pleistocene 5:41–43.

Location: AEA PMA/ASA
Topics: Dating, Dating - AMS, Faunal extinction

Stuart, A. J.

1991 Mammalian Extinctions in the Late Pleistocene of Northern Eurasia and North America. Biological Reviews 66:453-562.

The 'mass extinctions' at the end of the Pleistocene were unique, both in the Pleistocene and earlier in the geological record, in that the species lost were nearly all large terrestrial mammals. Although a global phenomenon, late Pleistocene extinctions were most severe in North America, South America and Australia, and moderate in northern Eurasia (Europe plus Soviet Asia). In Africa, where nearly all of the late Pleistocene 'megafauna' survives to the present day, losses were slight.

Ruling out epidemic disease of cosmic catastrophe, the contending hypotheses to explain late Pleistocene extinctions are: (*a*) failure to adapt to climatic/environmental change; and (*b*) extermination by human hunters ('prehistoric overkill').

This review focuses on extinctions in northern Eurasia (mainly Europe) in comparison with North America. In addition to reviewing the faunal evidence, the highly relevant environmental and archaeological backgrounds are summarized. The latest survival dates of extinct species are estimated from stratigraphic occurrences of fossil remains, radiocarbon dates, or association with archaeological industries. ...

From the evidence reviewed here, human predation at time of major climatic/environmental change is suggested as the most probable cause of late Pleistocene extinctions. In northern Eurasia overkill became possible only when large-mammal distributions, and thus populations, were already severely reduced by such changes. Similar extinctions did not occur earlier in the Pleistocene because 'anatomically modern humans' with upper palaeolithic hunting technologies were not present. In North America the main reason that losses were severe and sudden is probably the close coincidence of Lateglacial climatic/environmental changes with the arrival of Clovis hunters. ...

Notes: Part of the summary used as abstract. Extensive literature review with tables of radiocarbon dates and a comprehensive bibliography.
Location: AEU SCI QH 301 C17
Area: Beringia, North America
Topics: Palaeontology, Review of faunal extinctions, Review of faunal remains, Dating - analysis of radiocarbon dates, Zoogeography - extinct mammals

Takai, F.

1952 The Historical Development of Mammalian Faunae in Eastern Asia and the Interrelationships of Continents Since the Mesozoic. Japanese Journal of Geology and Geography 22:169-205.

The knowledge of mammalian faunae in Eastern Asia has been greatly developed during the past few decades. Eastern Asia is equally as rich in fossils as the central region of Africa, the western part of North America, and the Panpas of South America. As the fossil mammals of Eastern Asia have been studied by many authors, the mode of their development is locally different. Accordingly the different generic names have sometimes been used for the same forms and on the contrary the same for the different ones. Then the writer tries to uniform his identification by his own examination of fossils both in Japan and China and by his opinion being obtained from many references on the fossils of the other districts besides the afore mentioned two districts.

Notes: Abstract taken from introduction.
Location: AEU SCI QE 1 J35
Area: Japan, China, Mongolia, Siberia, Western Beringia, Korea
Topics: Faunal remains, Insect macrofossils, Human/hominid remains

Tobien, H.

1986 Migrations of Proboscideans and Lagomorphs (Mammalia) Across the Bering Land Bridge in the Late Cenozoic. Translated by R. Chakravarty. In *Beringia in the Cenozoic Era*, edited by V. L. Kontrimavichus, pp. 327-338. Russian Translation Series No. 28. A. A. Balkema, Rotterdam, The Netherlands.

For the Proboscideans the important factor for migration was the climate. Migrating species became well acclimated to the moderate and/or relatively cold climates of Beringia and regions lying on the route. Species incapable of withstanding such climatic conditions could not cross the Beringian Land Bridge.

Besides the climatic factors, there were ecological factors which hindered migration. For example, besides the occupation of a similar ecological niche by forms which were structurally and in adaptability similar, there were representatives of different species in Eurasia and North America. The progressive bunodont-mastodonts are perhaps examples of this situation.

There are two ways of studying the exchange of mammalian fauna across the land bridge: 1) overall analysis of the majority of taxa of higher order; 2) study of individual orders showing definite taxonomic variability and wide distribution on both continents. The author believes the second way can explain why some migrations took place and not others; it also helps us to understand the specific role of the Beringian Land Bridge in the Late Cenozoic.

Notes: Abstract taken from conclusions. Translation of *Beringiya v Kainozoe*. Vladivostok, 1976. Collection of papers presented at the All-Union Symposium "The Bering Land Bridge and its Role in the History of Holarctic Floras and Faunas in the Late Cenozoic" held at Khabarovsk in May, 1973.
Location: AEU POLAR 56:(*3) KON
Area: Western Beringia, Eastern Beringia
Topics: Palaeontology, Faunal migration, Zoogeography

Vangengeim, E. A.

1967 The Effect of the Bering Land Bridge on the Quaternary Mammalian Faunas of Siberia and North America. In *The Bering Land Bridge*, edited by D. M. Hopkins, pp. 281-287. Stanford University Press, Stanford, California.

Analysis of fossil faunas from the Anthropogene of Eastern Siberia indicates a possible connection between the American and Asiatic continents during the Villafranchian, when the migration of animals most probably took place across the area of the present continental shelf. Forests that developed farther south were probably avoided by open-country animals, such as horses. A close similarity between the faunas of Eastern Siberia and those of North America existed from the beginning of the Samarov (Illinoian) until the end of Sartan (Late Wisconsin) time. During this time interval, there could have been interruptions in the connection between continents, as indicated by the presence of transgressive marine

sediments in the extreme northeastern part of Asia. However, these interruptions need not have been lengthy, because neither in Asia nor in Alaska did substantially different mammals evolve. ...

Notes: Based on a Symposium held at the VII Congress of the International Association for Quaternary Research (INQUA), Boulder, Colorado, 1965. Part of Summary used as abstract.
Location: AEU SCI QE 39 H79
Area: Beringia
Topics: Palaeontology, Faunal associations, Faunal remains - Siberia, Beringian land bridge connection

PART 5. ARCHAEOLOGY AND HUMAN HISTORY

Aikens, C. M., and D. E. Dumond

1986 Convergence and Common Heritage: Some Parallels in the Archaeology of Japan and Western North America. In *Windows on the Japanese Past: Studies in Archaeology and Prehistory*, edited by R. J. Pearson, G. L. Barnes and K. L. Hutterer, pp. 163-178. Centre for Japanese Studies, University of Michigan, Ann Arbor, Michigan.

The prehistoric cultures of Japan and the west coast of North America share a number of characteristics that reflect both culture-historical connections and developmental parallels. The following discussion deals specifically with three sets of these commonalities.

First, the Japanese Paleolithic sequence demonstrates the successive emergence of large end-blow flakes and blades, side-blow flakes, leaf-shaped bifacial points, and wedge-shaped microcores and microblades. From these we can derive models of the lithic technology carried into the New World by early Americans. Second, by 10,000 B.P. the forest-adapted Jomon culture achieves a mature form in Japan, incorporating the use of mollusks, anadromous fish, acorns and other vegetal foods, and scattered woodland game. These subsistence patterns are similar to developments on the west coast of North America, the shared similarities the result of parallel adaptation to comparable environments. Third, the close similarities noted ethnologically between the Ainu of northern Japan, the Koryak and other peoples of Northeast Asia, and the Eskimo, Aleut, and Northwest Coast peoples of North America reflect both parallel adaptation and a period of significant culture-historical interchange around 2000 B.P.

Notes: Introduction used as abstract.
Location: AEU HSS GN 855 J2 W765, AEA PMA/ASA 915.203 W724
Area: Japan, Western Beringia, Alaska, Eastern Beringia, Kamchatka
Topics: Archaeological sites - Japan, Archaeological sites - Lake Ushki, Archaeological sites - Healy Lake, Archaeological sites - Dry Creek, Archaeological sites - Eastern Beringia, Palaeontological sites - Old Crow, Archaeological sites - Diuktai Cave, Human migration, Lithics, Lithic affinities, Dating - obsidian hydration, Cultural traditions

Arutiunov, S. A., and W. W. Fitzhugh

1988 Prehistory of Siberia and the Bering Sea. In *Crossroads of Continents: Cultures of Siberia and Alaska*, edited by W. W. Fitzhugh and A. Crowell, pp. 117-129. Smithsonian Institution Press, Washington, D.C.

Location: AEU HSS GN 635 S5 C95
Area: Siberia - northeastern, Western Beringia, Alaska, Kamchatka, Eastern Beringia
Topics: Human migration, Cultural traditions, Archaeological sites - Western Beringia, Archaeological sites - Lake Ushki, Archaeological sites - Eastern Beringia, Archaeological sites - Anangula, Archaeological sites - Groundhog Bay, Archaeological sites - Healy Lake, Archaeological sites - Dry Creek, Lithics

Bryan, A. L.

1970 Arrival of Man in the New World. In *AMQUA, 1st Biennial Meeting, Abstracts*, pp. 17-18.

Location: AEU HSS QE 696 A52
Area: Eastern Beringia
Topics: Human migration, Ice-free corridor, Lithics, Bone modification

1978 An Overview of the Paleo-American Prehistory from a Circum-Pacific Perspective. In *Early Man in America from a Circum-Pacific Perspective*, edited by A. L. Bryan, pp. 306-327. Occasional Papers No 1 of the Department of Anthropology, University of Alberta. Archaeological Researches International, Edmonton, Alberta.

Recently, there has been a rapidly accruing body of substantiable evidence which tends to support the old claims that earliest man must have entered America long before the last ice sheets began to melt. Although some workers in the field, most notable Paul S. Martin (1973), would still maintain that there is no unequivocal evidence for American man earlier than the Clovis complex of the tenth millennium B.C., I sense that most conservative thinkers, on the basis of the evidence reported from widely separated localities such as Pikimachay, Tlapacoya, Meadowcroft, and Old Crow, are now willing to concede that man probably entered America during a major interstadial of the Last Glacial (Wisconsinan), perhaps 25,000 years ago. I believe that the available factual evidence presented in the papers to follow will convince many people interested in the problem that an earlier entry is much more likely. The available evidence is used in this overview as a basis for deducing a model and testable hypotheses in support of an earlier entry.

Location: AEU HSS GN 17 E12
Area: Alaska, Yukon - northern, Eastern Beringia, Siberia, Western Beringia, Kamchatka
Topics: Lithics, Lithic affinities, Cultural traditions, Archaeological sites, Human migration, Archaeological sites - Gallagher Flint Station, Archaeological sites - Healy Lake, Archaeological sites - Dry Creek, Palaeontological sites - Old Crow, Bone modification, Archaeological sites - Lake Ushki, Archaeological sites - Diuktai Cave, Human/hominid remains

1984 Human Adaptation to Cold Climate: Archaeological Evidence for Migration to America. Bollettino del Centro Camuno di Studi Preistorici 21:95-106.

Area: Siberia, Western Beringia, Yukon - northern, Eastern Beringia
Topics: Human migration, Archaeological sites - Siberia, Archaeological sites - Afontova Gora, Archaeological sites - Malta, Archaeological sites - Diuktai Cave, Archaeological sites - Zhoukoudian, Palaeontological sites - Old Crow, Bone modification, Cultural traditions, Cultural traditions - Diuktai, Cultural traditions - Malta/Afontova, Lithics

Bryan, A. L., A. J. Jelinek, and I. Rouse
1980 Three Perspectives on the Archaeological Evidence for the Peopling of the Northern Hemisphere. Canadian Journal of Anthropology 1(2):239-245.

Three overviews of the available archaeological evidence relevant to the peopling of the temperate, subarctic and arctic regions of the northern hemisphere are juxtaposed. In particular, the relevance of evidence in various parts of Eurasia to the question of the peopling of America is discussed.

Location: AEU PMC GN 1 C22
Area: Western Beringia, Eastern Beringia
Topics: Human migration, Archaeological sites, Archaeological sites - Dry Creek, Archaeological sites - Zhoukoudian, Archaeological sites - Eastern Beringia, Cultural traditions, Cultural traditions - Diuktai, Cultural traditions - Malta/Afontova, Lithics, Lithic affinities, Hominid evolution, Climate history, Palaeontological sites - Old Crow, Bone modification

Chard, C. S.
1958 New World Migration Routes. Anthropological Papers of the University of Alaska 7(1):23-26.

Location: AEU HSS F 906 A32
Area: Western Beringia, Eastern Beringia
Topics: Glacial history, Human migration, Sea level changes

Chartkoff, J. L.

1985 Shores: Perspectives on Paleoamerican Habitat, Subsistence, and Society in the Far West. In *Woman, Poet, Scientist: Essays in New World Anthropology Honoring Dr. Emma Louise Davis*, edited by T. C. Blackburn, pp. 37-55. Ballena Press Anthropological Papers No. 29. Ballena Press/Great Basin Foundation Cooperative Publication, Los Altos/San Diego, California.

Traditional methods of archaeological analysis, such as the comparison of tool types, industries, and technologies, have not proved fruitful in demonstrating the reality of Pleistocene-age Paleoamerican cultures of the Far West, their nature, or their relationships to antecedent cultures of the northeastern Asian Upper Paleolithic. A comparative review of the northeastern Asian materials suggests that fruitful comparisons can be made of the lifeways and adaptive strategies followed in the two regions. It is suggested that in both regions cultures of the late Pleistocene occupied the boundary between forested hills and mountains on the one hand, and on the other, lowlands dominated by *Artemesia* [sic] steppe, grasslands, and woodlands, utilizing the resources of both zones. Such cultures followed migratory lifeways of mixed hunting-gathering, exploiting a variety of animals and using plant products that did not require specialized technology. The habitats in western North America that offered rich food supplies in settings ecologically most comparable to those of northeastern Asia were the lacustrine zones of the Far West. In this paper it is argued that Paleoamericans first concentrated on that niche, and did not begin to exploit other niches systematically until after the lacustrine niche had been filled throughout the West. The study alleges parallels between coastal and interior sites that show a common adaptive pattern. It recognizes the tentativeness of the reconstruction, however, due to the weak quality of data that inspire it. Reconstruction of late Pleistocene landscapes, systematic sampling of them, and the reexcavation of extant sites along the coast alleged to be of Pleistocene age are suggested as ways for testing the model.

Location: AEU HSS E 61 W87
Area: Western Beringia, Eastern Beringia, Kamchatka
Topics: Archaeological studies - Siberia, Lithics, Lithic affinities, Bone modification, Archaeological sites - Siberia, Archaeological sites - Japan, Archaeological sites - Osinovka, Archaeological sites - Japan - Hokkaido, Archaeological sites - Diuktai Cave, Archaeological sites - Lake Ushki, Archaeological sites - Eastern Beringia, Cultural traditions, Vegetation history, Human migration, Sea level changes, Faunal remains

Collins, H. B.

1970 Prehistoric Cultural Relations between Japan and the America Arctic: Eskimo and Pre-Eskimo. In *Proceedings VIIIth International Congress of Anthropological and Ethnological Sciences, Tokyo and Kyoto, 1968. Volume III. Ethnology and Archaeology*. Symposium S-11 Prehistoric Cultural Relationships in Northern Eurasia and Northern North America, pp. 358-359. Science Council of Japan, Tokyo, Japan.

Location: AEU SCI GN 3 I59
Area: Eastern Beringia, Japan, Aleutian Islands
Topics: Human migration, Lithics, Archaeological sites - Anangula, Archaeological sites - Japan - Hokkaido, Cultural traditions

Gai Pei

1991 Microblade Tradition around Northern Pacific Rim: In View of China. In *INQUA, 13th International Congress, Beijing, China, Abstracts*, p. 104.

Area: China, Japan - Hokkaido, Western Beringia, Eastern Beringia
Topics: Cultural traditions, Lithics, Lithic affinities, Archaeological sites - China, Archaeological sites - Shiyu, Archaeological sites - Hutouliang, Cultural traditions, Archaeological sites - Alaska

Greenberg, J. H., C. G. Turner II, and S. L. Zegura

1986 The Settlement of the Americas: A Comparison of the Linguistic, Dental, and Genetic Evidence. Current Anthropology 27:477-497.

The three lines of evidence, linguistic, dental, and genetic, lead to closely similar divisions of the indigenous New World population into three groups; Amerind, Na-Dene, and Aleut-Eskimo. In our opinion, the most reasonable historical interpretation is that these three represent three migrations from Asia. The order and chronology remain, however, less certain, especially the relative chronological priority of the Na-Dene and the Aleut-Eskimo.

Notes: Conclusions used as abstract.
Location: AEU PMC GN 1 C97
Topics: Linguistics, Human genetics, Dentition, Human migration, Hominid evolution

Griffin, J. B.

1979 The Origin and Dispersion of American Indians in North America. In *The First Americans: Origins, Affinities, and Adaptations*, edited by W. S. Laughlin and A. B. Harper, pp. 43-55. Gustav Fischer, New York, New York.

All the supportable evidence available indicates that the first human occupants of North America came from northeastern Asia. Some archaeologists support the view that this first occurred from 30,000 to 40,000 or more years ago, others believe it was from about 25,000 to 20,000 years ago, and some have contended that it could not have been until about 12,000 years ago. The time of arrival has not been settled.

Some archaeologists emphasize the Mousterian origins of the first emigrants, believing that the earliest American cultural complexes indicate a spread into North America before elements of Upper Paleolithic origin had reached eastern Asia. Many archaeologists, however, believe that Upper Paleolithic developments were a part of the cultural mechanisms that allowed man to move into North America and spread throughout the New World.

The main access route into interior North America was east of the Rocky Mountains, and dispersion into most of the Americas was by this route. Population increase and any physical differentiation of human groups south of the Arctic area is derived primarily from the population of the Paleo-Indian period. There are not indications in the prehistoric record of any later substantial migrating groups influencing the cultural life of the residents of North America south of the Alaskan and Canadian Arctic region.

The archaeologic evidence, except in rare instances, supports the view that, in spite of regional adaptations to food supplies and raw materials, there was a continuous exchange of new developments between regions, with the additional implication of population interaction as well.

Notes: Summary and conclusions used as abstract.
Location: AEU HSS E 61 F52
Area: Eastern Beringia, Siberia, Western Beringia, Kamchatka
Topics: Human migration, Cultural traditions, Archaeological sites - Eastern Beringia, Archaeological sites - Malta, Archaeological sites - Afontova Gora, Archaeological sites - Lake Ushki, Archaeological sites - Kokorevo, Lithics, Ice-free corridor

Haynes Jr., C. V.

1969 The Earliest Americans. Science 166:709-715.

Location: AEU SCI Q 1 S41
Area: Eastern Beringia
Topics: Human migration, Faunal remains, Geoarchaeology, Lithics, Ice-free corridor, Archaeological studies - Eastern Beringia, Glacial history, Faunal extinction, Archaeological sites - Eastern Beringia

Haynes, V.

1986 Mammoth Hunters of the USA and USSR. Translated by R. Chakravarty. In *Beringia in the Cenozoic Era*, edited by V. L. Kontrimavichus, pp. 557-570. Russian Translation Series No. 28. A. A. Balkema, Rotterdam, The Netherlands.

In the New World mammoth hunting was practiced by people of the Clovis (Llano) Complex, whose peculiar fluted projectile points have been found in association with mammoth skeletons at 10 buried sites in the southwestern United States. Seven of the sites have been radiocarbon dated at between 11,500 and 11,000 years old, and the stratigraphic dating of all of the others is consistent with this age, which falls in the earliest part of the late Paleo-Indian period.

Other Clovis-related sites in the western and eastern United States have not been accurately dated for lack of adequate stratigraphy and suitable material for radiocarbon dating, but the occurrence of complete cultural sequences going back to 10,500 BP indicates that fluted-point makers must be somewhat older than this in both the west and east.

Evidence of human occupation of the New World before Clovis is controversial, but the most plausible evidence shows little if any relation to Clovis, whose artifacts show much more advanced technique than any artifacts preceding it.

The common occurrences in Clovis artifact assemblages of well-made bifaces, trilateral blades, unifacial scrapers and/or knives, burins, and skillfully worked bone tools show closer affinities to Old World Upper Paleolithic mammoth-hunting cultures than any of the potential middle Paleo-Indian sites of the New World.

These facts suggest that the Clovis complex did not develop from indigenous cultures, but represents a separate invasion of central North America from Alaska, where artifacts have been found but not accurately dated.

Similarities between certain aspects of the mammoth-hunting sites of Kostyenki, Sungir, Kokorevo, Afontova Gora, etc., and the Clovis sites suggest some distant relationship between Upper Paleolithic mammoth hunters of the USSR and the Clovis mammoth hunters of the United States.

We have very few examples of Clovis mammoth-hunter camp sites in the United States, but the Murray Springs hunting camp, although small by Old World standards, shows features similar to mammoth-hunting camps on the Russian Plains. Recent discoveries in the Great Plains of North America show that Paleo-Indians probably made extensive use of red ocher [sic], as did the Upper Paleolithic hunters.

The "missing links" of information lie in eastern Siberia, Beringia, Alaska and western Canada, where Early Man exploration is at a rudimentary stage compared with the western USSR and the conterminous United States. Whether the Clovis Complex represents a distinct invasion of the New World by mammoth hunters or indigenous development and rapid diffusion across a pre-existing population base may be learned from the geochronology of mammoth hunters in these areas.

From an examination of first-hand the recent fields of Dr. Y.A. Mochanov from the Aldan River area it is apparent that the problem of the origin of the Clovis Culture is not related to the Dyuktai Culture of eastern Siberia, which is dominated by wedge-shaped cores, small blades and burins. Even though large blades and foliate bifacial forms do occur, they are not the predominant industry, which would have to be described as core and blade.

The few facts available about (1) the age of the Clovis sites, (2) the similarities of their nonprojectile point artifacts to some Upper Paleolithic assemblages, and (3) the absence of an adequate population base in central North America before 12,000 BP are best explained by the hypothesis that big-game specialists entered central North America at the final deglaciation and proliferated south of the retreating ice.

Notes: Translation of *Beringiya v Kainozoe*. Vladivostok, 1976. Collection of papers presented at the All-Union Symposium "The Bering Land Bridge and its Role in the History of Holarctic Floras and Faunas in the Late Cenozoic" held at Khabarovsk in May, 1973.

Location: AEU POLAR 56:(*3) KON

Area: Eastern Beringia, Siberia, Western Beringia

Topics: Archaeological sites - Eastern Beringia, Archaeological sites - Gallagher Flint Station, Archaeological sites - Siberia, Archaeological sites - Kokorevo, Archaeological sites - Afontova Gora, Archaeological sites - Malta/Buryet, Archaeological sites - Diuktai Cave, Lithics, Cultural traditions, Cultural traditions - Diuktai, Geoarchaeology, Faunal remains - *Mammuthus primigenius*

Hester, J. J.

1978 Comments on Paper "Perspectives on Early Man" [by] William Roger Powers. In *AMQUA, 5th Biennial Meeting, Edmonton, Alberta, Abstracts*, p. 126.

Location: AEU HSS QE 696 A5212

Area: Western Beringia, Eastern Beringia

Topics: Human migration, Lithics, Bone modification, Ice-free corridor, Archaeological sites - Anangula

Hoffecker, J. F., W. R. Powers, and T. Goebel

1993 The Colonization of Beringia and the Peopling of the New World. Science 259:46-53.

The colonization of Beringia appears closely linked to the arrival of the oldest firmly documented archeological tradition in mid-latitude North America (Paleoindian). The discovery of a Paleoindian complex in central Alaska, combined with the recent redating of the Bering Land Bridge and key archeological sites, suggests that Beringia was settled during the final Pleistocene interstadial (12,000 to 11,000 years before present). Its population expanded rapidly into other parts of the New World. Beringia probably was colonized in response to changes in climate and vegetation that occurred during this interstadial. Access to the Americas was controlled by Beringian environments and not by changing sea levels or continental ice masses.

Location: AEU SCI Q 1 S41
Area: Alaska, Eastern Beringia, Kamchatka
Topics: Human migration, Beringian ecology, Sea level changes, Glacial history, Ice-free corridor, Vegetation history, Climate history, Archaeological sites - Dry Creek, Archaeological sites - Tangle Lakes, Archaeological sites - Walker Road, Archaeological sites - Trail Creek, Archaeological sites - Onion Portage, Archaeological sites - Groundhog Bay, Palaeontological sites - Old Crow, Archaeological sites - Alaska, Archaeological sites - Healy Lake, Archaeological sites - Berelekh, Archaeological sites - Lake Ushki, Geoarchaeology, Lithics, Lithic affinities, Cultural traditions, Faunal remains, Bone modification

Irving, W. N.

1962 A Provisional Comparison of some Alaskan and Asian Stone Industries. In *Prehistoric Cultural Relations between the Arctic and Temperate Zones of North America*, edited by J. M. Campbell, pp. 55-68. Arctic Institute of North America Technical Paper No. 11. Washington.

Location: AEU HSS GN 31 C18
Area: Alaska, Eastern Beringia, Siberia, Western Beringia, Japan - Hokkaido
Topics: Lithics, Lithic affinities, Cultural traditions, Archaeological sites - Alaska, Archaeological sites - Anangula, Archaeological sites - Siberia

1976 Man in the Steppe Tundra: Discussion. In *AMQUA, 4th Biennial Meeting, Tempe, Arizona, Abstracts*, p. 92.

Area: Western Beringia, Japan, Eastern Beringia
Topics: Human migration, Lithics

1976 Reflections. Asian Perspectives 19:91-95.

Location: AEU PMC DS 514 A83
Area: Japan - Hokkaido, China - northern, Eastern Beringia, Siberia, Western Beringia
Topics: Lithics, Archaeological sites, Archaeological sites - Japan - Hokkaido, Palaeontological sites - Old Crow, Bone modification, Archaeological studies, Human migration, Cultural traditions - Diuktai

1978 An Approach to the Prehistory of the Far East, from Farther East. In *Early Paleolithic in South and East Asia*, edited by F. Ikawa-Smith, pp. 329-336. Aldine Publishing Company, Chicago, Illinois.

Location: AEU HSS GN 772.3 A1 E12
Area: Western Beringia, Eastern Beringia
Topics: Human migration, Cultural traditions, Cultural traditions - Diuktai, Lithics, Archaeological sites, Palaeontological sites - Old Crow, Bone modification, Faunal remains, Faunal remains - *Mammuthus primigenius*, Faunal remains - *Bison crassicornis*, Faunal remains - *Equus*

Klein, R. G.

1975 The Relevance of Old World Archeology to the First Entry of Man into the New World. Quaternary Research 5:391-394.

Archeological evidence from the USSR suggests that cultural adaptations to the most rigorous (most continental) environments of northern Eurasia were not achieved until 35-40,000 BP. This presumably sets an absolute basement date for the entry of man into Alaska through the region of Beringia. The absence of evidence for pre-14,000 yr old man in the 48 adjacent United States comparable in any sense to the evidence that has been developed for man prior to 14,000 y.a. in the Old World suggests that movement south out of Alaska only occurred after 14,000 BP.

Location: AEU SCI QE 696 Q24
Area: Western Beringia, Eastern Beringia
Topics: Human migration, Palaeontological sites - Old Crow, Faunal migration

MacNeish, R. S.

1976 Early Man in the New World. American Scientist 64:316-327.

Location: AEU SCI Q 1 A51
Area: Eastern Beringia
Topics: Human migration, Archaeological sites - Eastern Beringia, Archaeological sites - Healy Lake, Archaeological sites - Onion Portage, Palaeontological sites - Old Crow, Lithics, Lithic affinities, Faunal extinction, Ice-free corridor

1979 Earliest Man in the New World and its Implications for Soviet-American Archaeology. Arctic Anthropology 16(1):2-15.

Many recent archaeological finds of early human occupation in the New World are described and tentatively grouped into four stages. An effort is made to point out general resemblances between certain early New World materials and some in China and Siberia. Where resemblances are not clear, an attempt is made to indicate the type of materials and relationships which might be sought there in a cooperative U.S.-U.S.S.R. investigation as well as to pinpoint American assemblages which are unlikely to have close resemblances to those of the Old World.

Location: AEU PMC GN 1 A68
Area: Eastern Beringia
Topics: Palaeontological sites - Old Crow, Archaeological sites - Eastern Beringia, Geoarchaeology, Lithics, Lithic affinities, Faunal remains, Faunal extinction, Cultural traditions, Cultural traditions - Diuktai, Ice-free corridor, Human migration

Martin, P. S.

1970 Discussion to Flannery's Human Cultures between 14,000 and 9,000 Years Ago. In *AMQUA, Ist Biennial Meeting, Abstracts*, p. 86.

Location: AEU HSS QE 696 A52
Area: Eastern Beringia
Topics: Human migration

1982 The Pattern and Meaning of Holarctic Mammoth Extinction. In *Paleoecology of Beringia*, edited by D. M. Hopkins, J. V. Matthews Jr., C. E. Schweger and S. B. Young, pp. 399-408. Academic Press, New York, New York.

It is unlikely that climatic change at the time of the last glacial was the primary cause of mammoth and other megafaunal extinctions. The mammoth fauna had survived similar periods of climatic transformation. Moreover in western Europe mammoth extinction apparently preceded the disappearance of steppe-tundra, the mammoth's supposed habitat.

The global pattern of all extinctions of large land mammals appears to follow Paleolithic man's footsteps. The loss of many large herbivores in North and South America, apparently suddenly, between 12,000 and 10,000 years ago is consistent with this pattern. The presence of man, and of a hunting culture, in America during this period is well accepted by archaeologists. Computer modeling of the needs of a hunter population growing at the rate of only 1% per year and advancing southward from the Bering land bridge suggests that mammoth extinction from human predation alone could have taken place in less than 500 years.

Location: AEU SCI QE 720 W47, AEA PMA/ASA 560.45 P174
Area: Eastern Beringia, Western Beringia, Kamchatka
Topics: Human migration, Megafauna, Faunal extinction, Climate history, Zoogeography - *Mammuthus*, Archaeological sites, Archaeological sites - Siberia, Archaeological sites - Berelekh, Archaeological sites - Diuktai Cave, Archaeological sites - Eastern Beringia, Archaeological sites - Lake Ushki

Morlan, R. E.

1976 Early Man and High Latitudes: A Comment on "Cultural Adaptations to Pleistocene 'Steppe Tundras' in the Old World," by Richard G. Klein. In *AMQUA, 4th Biennial Meeting, Tempe, Arizona, Abstracts*, pp. 93-94.

Area: Western Beringia, Eastern Beringia
Topics: Human migration, Beringian environment

1987 The Pleistocene Archaeology of Beringia. In *The Evolution of Human Hunting*, edited by M. H. Nitecki and D. V. Nitecki, pp. 267-307. Plenum Publishing Corporation, New York, New York.

Location: AEU HSS GN 799 H84 S769
Area: Eastern Beringia, Western Beringia, Kamchatka
Topics: Human migration, Archaeological sites - Berelekh, Archaeological sites - Diuktai Cave, Archaeological sites - Lake Ushki, Archaeological sites - Western Beringia, Archaeological sites - Anangula, Archaeological sites - Bluefish Caves, Archaeological sites - Dry Creek, Archaeological sites - Gallagher Flint Station, Archaeological sites - Trail Creek, Archaeological sites - Eastern Beringia, Palaeontological sites - Old Crow, Bone modification, Geoarchaeology, Lithics, Lithic affinities, Cultural traditions, Cultural traditions - Diuktai, Cultural traditions - Malta/Afontova, Taphonomy, Faunal remains, Beringian ecology, Glacial history, Climate history, Vegetation history

Müller-Beck, H.

1966 Paleohunters in America: Origins and Diffusion. Science 152:1191-1210.

Against the background of the natural history of the most recent past, the specialization of the Paleohunters in the open plains of Eurasia since more than 65,000 years ago and their adaptation to a changing climate, up to subarctic conditions, can be documented. The expansion of these hunters over northern Eurasia and their crossing of the Bering land bridge, as the first known invaders of America, about 28,000 to 26,000 years ago, are reconstructed. Afterward the invaders were isolated by the ice advances of the Wisconsin maximum in the southern part of North America and separated from the continuing technological evolution of the Old World. The contact between Asia and interior America was not feasible again until the melting of the inland ice barrier, when Aurignacoid groups invaded or expanded over North America for the first time. The technical influence of those industries remained more restricted than their probable spiritual one. The first invaders must be considered as the ancestors of the Plains Indians; the second, as those of the Eskimos and Aleuts.

Notes: Summary used as abstract.
Location: AEU SCI Q 1 S41
Area: Western Beringia, Eastern Beringia
Topics: Cultural traditions, Lithics, Climate history, Sea level changes, Faunal associations, Faunal migration, Human migration, Archaeological sites, Archaeological sites - Malta

1967 On Migrations of Hunters Across the Bering Land Bridge in the Upper Pleistocene. In *The Bering Land Bridge*, edited by D. M. Hopkins, pp. 373-408. Stanford University Press, Stanford, California.

Notes: Based on a Symposium held at the VII Congress of the International Association for Quaternary Research (INQUA), Boulder, Colorado, 1965.
Location: AEU SCI QE 39 H79
Area: Beringia
Topics: Review of archaeology - Europe, Review of archaeology - Siberia, Faunal remains, Beringian land bridge connection, Cultural traditions, Lithics, Human migration, Archaeological sites - Anangula

Powers, W. R.

1978 Perspectives on Early Man. In *AMQUA, 5th Biennial Meeting, Edmonton, Alberta, Abstracts*, pp. 114-122.

Location: AEU HSS QE 696 A5212
Area: Western Beringia, Eastern Beringia, Kamchatka
Topics: Human migration, Cultural traditions, Cultural traditions - Diuktai, Ice-free corridor, Lithics, Archaeological sites - Western Beringia, Archaeological sites - Lake Ushki, Archaeological sites - Kokorevo, Archaeological sites - Eastern Beringia, Archaeological sites - Gallagher Flint Station, Archaeological sites - Anangula, Archaeological sites - Dry Creek, Archaeological sites - Healy Lake, Palaeontological sites - Old Crow, Bone modification

Rogers, R. A., L. A. Rogers, and L. D. Martin

1992 How the Door Opened: The Peopling of the New World. Human Biology 64(3):281-302.

The timing, pathways, and number of migrations involved in the early peopling of the New World are examined from a variety of perspectives. Ultimately, the occupation of the Western Hemisphere was a direct result of boreal cultural adaptations in the Old World. Here, we discuss (1) the dates of appearance of these boreal cultural adaptations and their relevance to the peopling of America, (2) archeological and linguistic evidence bearing on the earliest peopling of the New World, (3) ecological and linguistic evidence on two alternative routes into the New World, and (4) the assumptions present in various migration models. The relative strengths of opposing hypotheses are analyzed by observing whether different approaches point to the same answers.

Location: AEU SCI GN 1 H918
Area: Western Beringia, Eastern Beringia
Topics: Human migration, Cultural traditions, Faunal extinction, Archaeological sites - Western Beringia, Archaeological sites - Eastern Beringia, Linguistics, Ice-free corridor, Refugia

Turner II, C. G.

1971 Three-Rooted Mandibular First Permanent Molars and the Question of American Indian Origins. American Journal of Physical Anthropology 34:229-242.

Three-rooted mandibular first molars (3RM1) are characteristic of Asian and Asian-derived populations, particularly Aleuts (whose 3RM1 frequency is the highest in the world) and Eskimos. Similarities in the frequency of these teeth between American Indians and contemporary peoples of southeastern Asia indicate a closer relation between these groups than between American Indians and Aleut-Eskimos. Three-rooted mandibular first molar frequency does not differ significantly in males and females except in Aleut-Eskimos. Bilateral asymmetry of 3RM1 is relatively frequent in both sexes and all groups. All American Indian groups examined have a low frequency of 3RM1 pointing to a single Asian origin, except Athabaskan-speaking Arizona Navajos, whose 3RM1 frequency approaches that of Aleut-Eskimos. There is no evidence at present of any significant local microevolution of 3RM1 in two testable prehistoric American Indian groups, although genetic drift had possibly occurred in a few series of 3RM1-deficient southwestern U. S. prehistoric Western Pueblo Indians. No adaptive value can be found for 3RM1 in Indians. In prehistoric western U. S. Indians

geographic frequency variation is only slightly greater than the very slight (and non-significant) testable temporal variation. Three migrations from Asia seem best to explain New World 3RM1 frequency variation.

Location: AEU PMC GN 1 A49
Area: Eastern Beringia
Topics: Dentition, Human migration

1983 Dental Evidence for the Peopling of the Americas. In *Early Man in the New World*, edited by R. Shutler Jr., pp. 147-157. Sage Publications, Beverly Hills, California.

The problem of the peopling of the Americas appears to be a relatively simple one from a dental anthropological viewpoint. The pattern that prehistoric New World dental variation exhibits is a partitioning into three fairly clear geographic clusters: Arctic coast (Aleut-Eskimo), Alaska interior-Northwest Coast (mainly Na-Dene-speaking Indians), and all the rest of North and South America (Indian). These three groups can be recognized in both univariate and multivariate comparisons. Since very little dental evolution can be demonstrated as having occurred since the time of Paleoindian arrival, the Aleut-Eskimo, Na-Dene, and Indian dental differences are probably best looked upon as due to original differences in their respective Old World ancestral populations.

Notes: Abstract taken from introduction.
Location: AEU HSS E 61 E12
Area: Eastern Beringia, Western Beringia
Topics: Dentition, Human migration, Cultural traditions, Archaeological sites - Healy Lake, Archaeological sites - Dry Creek, Archaeological sites - Groundhog Bay, Archaeological sites - Anangula, Archaeological sites - Malta, Archaeological sites - Zhoukoudian

1985 The Dental Search for Native American Origins. In *Out of Asia: Peopling the Americas and the Pacific*, edited by R. Kirk and E. Szathmary, pp. 31-78. The Journal of Pacific History Inc., Canberra, Australia.

Location: AEU HSS E 61 O9
Area: Western Beringia, Eastern Beringia, China, Japan, Kamchatka
Topics: Dentition, Human genetics, Human migration, Cultural traditions, Lithics, Lithic affinities, Archaeological sites - Zhoukoudian, Archaeological sites - Berelekh, Archaeological sites - Lake Ushki, Archaeological sites - Hutouliang, Archaeological sites - Xiachuan, Archaeological sites - Anangula, Archaeological sites - Dry Creek

1986 The First Americans: The Dental Evidence. National Geographic Research 2(1):37-46.

Dental morphology of 9000 American Indians, Aleuts, and Eskimos reveals three major New World population clusters - Aleut-Eskimo, Greater Northwest Coast (Na-Dene), and all other North and South American Indians (Macro-Indian). These dental groups suggest three founding migrations in late Pleistocene times, each apparently from a different region of northeastern Siberia. The correspondences between the dental groups and early archaeological complexes are hypothesized to be: Aleut-Eskimo arose from a Hokkaido-Ainur to an Anangula Island, unifacial blade-making coastal people. Greater Northwest Coast (Na-Dene) arose from the Siberian Diuktai to an American Paleo-Arctic, microblade-using "forest" population. Macro-Indian began as steppe, game-hunting American Clovis but no Siberian parallel is currently known. Comparisons of ancient and modern east Asians and Europeans reveal that the founding Siberian-American groups must have come from a north China Sinodont people about 20 000 years ago.

Location: AEU SCI QH 1 N27
Area: Western Beringia, Eastern Beringia, China - northern, Japan
Topics: Dentition, Human genetics, Linguistics, Human migration, Cultural traditions, Lithics, Archaeological sites - Anangula, Archaeological sites - Malta, Archaeological sites - Zhoukoudian

1988 Ancient Peoples of the North Pacific Rim. In *Crossroads of Continents: Cultures of Siberia and Alaska*, edited by W. W. Fitzhugh and A. Crowell, pp. 111-116. Smithsonian Institution Press, Washington, D.C.

This essay briefly reviews some of the anatomical, genetic, and other biological research that has been carried out on the living and prehistoric inhabitants of Northeastern Siberia and Alaska. The emphasis is on findings that help in understanding where the original homeland of these peoples was located, how they spread into the Americas, and what can be inferred about their later history from intergroup biological variation.

Bering Strait is indeed the crossroads of continents. But, not until the Russian discovery of Alaska was it traveled by any people other than the descendants of those first families that moved northward from North China and Mongolia into virgin Northeastern Siberia about 15,000 years ago. This story, which began in very ancient times, can be told because of the genetic history embedded in the coded anatomy of teeth, bones, and many other biological features.

Notes: Abstract taken from introduction and conclusion.
Location: AEU HSS GN 635 S5 C95
Area: Western Beringia, Eastern Beringia, China, Japan
Topics: Human migration, Dentition, Human genetics

1992 New World Origins: New Research from the Americas and the Soviet Union. In *Ice Age Hunters of the Rockies*, edited by D. J. Stanford and J. S. Day, pp. 7-50. Denver Museum of Natural History and University Press of Colorado, Niwot, Colorado.

The peopling of the Americas was the longest overland migration in human history, involving at least 15,000 mi, and probably not much more than 150 generations; that is, about 100 mi per generation. If Paleoindians kept track of their ancestors, as did Polynesians, then those who reached Tierra del Fuego might have had legends about their original Siberian homeland and its people. Whether this happened or not, Paleoindians carried with them a genetic record of their origins that can be found in the anatomy of their skeletons and teeth. I want to review this record of Native American origins by summarizing established and new dental anthropological information on Paleoindians and later native peoples of the New World. This will be followed by a review of recent dental and archaeological research here and in the Soviet Union that bears on the question of Indian origins and anthropological variation. The two main points of this review will be that teeth indicate there were three migrations, and the ultimate homeland of these migrants was in the north China-Outer Mongolia region.

Notes: Abstract taken from introduction.
Location: AEU HSS E 78 R63
Area: Eastern Beringia, Western Beringia
Topics: Human migration, Dentition, Archaeological sites, Archaeological sites - Siberia

West, F. H.

1981 *The Archaeology of Beringia*. Columbia University Press, New York, New York. 268 pp.

Location: AEU HSS F 951 W516
Area: Eastern Beringia, Western Beringia, Kamchatka
Topics: Modern biogeography, Pollen analysis, Vegetation history, Climate history, Glacial history, Periglacial features, Faunal remains, Lithics, Lithic affinities, Geoarchaeology, Bone modification, Refugia, Human migration, Cultural traditions, Ice-free corridor, Archaeological sites - Eastern Beringia, Archaeological sites - Western Beringia, Archaeological sites - Anangula, Archaeological sites - Dry Creek, Archaeological sites - Bluefish Caves, Archaeological sites - Gallagher Flint Station, Archaeological sites - Trail Creek, Archaeological sites - Healy Lake, Archaeological sites - Tangle Lakes, Archaeological sites - Groundhog Bay, Archaeological sites - Diuktai Cave, Archaeological sites - Berelekh, Archaeological sites - Lake Ushki, Palynological sites - Eastern Beringia, Palynological sites - Western Beringia, Palaeontological sites - Old Crow, Review of archaeology - Beringia

Zegura, S.

1985 The Initial Peopling of the Americas: An Overview. In *Out of Asia: Peopling the Americas and the Pacific*, edited by R. Kirk and E. Szathmary, pp. 1-18. The Journal of Pacific History Inc., Canberra, Australia.

Location: AEU HSS E 61 O9
Area: Western Beringia, Eastern Beringia, China
Topics: Human migration, Human genetics, Hominid evolution, Beringian ecology, Cultural traditions, Faunal extinction, Dating

PART 6. MODERN BIOGEOGRAPHY

Bliss, L. C., and J. H. Richards

1982 Present-Day Arctic Vegetation and Ecosystems as a Predictive Tool for the Arctic-Steppe Mammoth Biome. In *Paleoecology of Beringia*, edited by D. M. Hopkins, J. V. Matthews Jr., C. E. Schweger and S. B. Young, pp. 241-257. Academic Press, New York, New York.

Present-day low- and high-arctic vegetation and plant production are described in addition to herbivore density and vegetation utilization. For the more important arctic rangelands, above-ground net annual production ranges from 70 g to 200 g m^{-2} (cryptogams comprise 30-50%). Large and small herbivores utilize only 1-2% of the vegetation in modern arctic ecosystems. Based upon food consumption rates of Alaskan and Canadian Inuit, the land and sea can support on a sustained-yield basis only 20% of the present coastal human population in Alaska and 7% in the Canadian western Arctic.

An ecosystem model is presented for Beringia 25,000 to 11,000 BP based upon the dominance of four major plant communities and six large herbivores. Assuming daily forage requirements of the herbivores, net annual plant production and forage harvest rates for a sustained yield, an estimated herbivore biomass and annual production is calculated as well as a human population density (0.02 - .03 km^{-2}). It is believed that only a diverse vegetation assemblage could have supported a diversity of herbivores and thus a human population. It is postulated that the earlier concept of an upland sedge-grass steppe-mammoth-man ecosystem could not have maintained a diversity of herbivores and carnivores without a diversity of plant communities.

Location: AEU SCI QE 720 W47, AEA PMA/ASA 560.45 P174
Area: Eastern Beringia
Topics: Beringian ecology, Modern biogeography, Beringian vegetation

Chernyavskii, F. B.

1986 Systematic Relationship of some Old and New World Land Mammals in Connection with the Problem of Beringia. Translated by R. Chakravarty. In *Beringia in the Cenozoic Era*, edited by V. A. Kontrimavichus, pp. 501-510. Russian Translation Series No. 28. A. A. Balkema, Rotterdam, The Netherlands.

This review is based on the study of collections of animals and the relevant literature. The author analyzes the taxonomic relationships of certain species of Eurasian and North American mammals to distinguish the following Holarctic species complex: *Sorex cinereus*, *Citellus parryi*, *Clethrionomys rutilus*, *Lemmus sibiricus*, *Microtus oeconomus*, *Canis lupus*, *Vulpes vulpes*, *Alopex lagopus*, *Ursus arctos*, *Mustela erminea*, *Mustela nivalis*, *Gulo gulo*, *Lynx lynx*, *Rangifer tarandus* and *Alces alces*. He also singles out a group of species which belong to those inhabiting northeastern Siberia and which, in northeastern America, are replaced by vicariates with systematic affinities, e.g. *Lepus timidus-L. othus*, *Ochotona hyperborea-O. collaris*, *Microtus gregalis-M. miurus*, *Ovis nivicola-O. dalli*. A disjunction is assumed to have taken place approximately in the Middle Pleistocene. Also noteworthy is the existence of a whole series of species, e.g. *Sciurus vulgaris-S. carolinensis*, *Eutamias sibiricus-E. minimus*, *Martes zibellina-M. americana*, *Ovis nivicola-O. canadensis*, etc., whose relationships are considerably less close than those of the above second group of animals and indicate an even earlier separation. All this suggests that the Bering Land Bridge existed in the Pleistocene at least three times, and that intensive exchange of fauna took place between Asia and America, the Asiatic expansion being predominant. An ecological analysis of the Pleistocene and Recent theriocomplexes of the Beringian region of the Holarctic shows that tundra, lowland and mountain, "tundra-steppe", forest-tundra and flood-forest landscapes were prevalent on the Bering Land Bridge in the second half of the Pleistocene.

Notes: Translation of *Beringiya v Kainozoe*, Vladivostok, 1976. Collection of papers presented at the All-Union Symposium "The Bering Land Bridge and its Role in the History of Holarctic Floras and Faunas in the Late Cenozoic" held at Khabarovsk in May, 1973.
Location: AEU POLAR 56:(*3) KON
Area: Beringia, North America, Siberia
Topics: Zoogeography - *Sorex*, Zoogeography - *Lepus*, Zoogeography - *Marmota*, Zoogeography - *Alces*, Zoogeography - *Cervus*, Zoogeography - *Ovis*, Zoogeography - *Ochotona*, Genetics - *Marmota*, Genetics - *Dicrostonyx*, Beringian land bridge connection

Korobitsyna, K. V., C. F. Nadler, N. N. Vorontsov, and R. S. Hoffmann

1974 Chromosomes of the Siberian Snow Sheep, *Ovis nivicola*, and Implications Concerning the Origin of Amphiberingian Wild Sheep (Subgenus *Pachyceros*). Quaternary Research 4:235-245.

The chromosomes of *Ovis nivicola*, described for the first time, exhibit 2n = 52, the lowest diploid number to be reported for wild sheep and goats. The new chromosomal data, together with a review of the fossil history of the genus, lead us to conclude that the bighorned wild sheep (subgenus *Pachyceros*) evolved their distinctive characteristics while isolated in the ice-free Beringian refugium, and then migrated southward into western North America when the glacial barriers melted, as first suggested by Cowan (1940).

Location: AEU SCI QE 696 Q24
Area: Western Beringia, Eastern Beringia
Topics: Genetics - *Ovis*, Zoogeography - *Ovis*, Faunal migration, Refugia, Faunal remains, Faunal associations

Martin, P. J.

1982 Digestive and Grazing Strategies of Animals in the Arctic Steppe. In *Paleoecology of Beringia*, edited by D. M. Hopkins, J. V. Matthews Jr., C. E. Schweger and S. B. Young, pp. 259-266. Academic Press, New York, New York.

Speculation with respect to the physiological and digestive strategies of large herbivores on the arctic steppe may be made more productive by examining the strategies used by species which appear to be modern analogs of these animals. Horses and elephants are monogastrics with large cecums; they are able to exist on low-protein, high-fiber forages by consuming relatively large quantities per unit of body weight and by using microbial protein from cecal fermentation. Ruminants such as bison can consume less feed per unit of body weight than horses or elephants and, hence, require forage which is somewhat higher in protein and lower in fiber. Herbivores use physiological and behavioral adaptations to survive in very cold weather. Selection would likely favor large animals that could grow rapidly and attain a large mature body size. The demise of the arctic steppe was likely due to change in the vegetation and, hence, in the supply of food.

Location: AEU SCI QE 720 W47, AEA PMA/ASA 560.45 P174
Topics: Modern biogeography, Beringian vegetation, Megafauna

Nadler, C. F., R. S. Hoffmann, N. N. Vorontsov, and R. I. Sukernik

1986 Evolutionary Relationships of some Beringian Mammals. Translated by R. Chakravarty. In *Beringia in the Cenozoic Era*, edited by V. A. Kontrimavichus, pp. 425-440. Russian Translation Series No. 28. A. A. Balkema, Rotterdam, The Netherlands.

Beringia served as a bridge for intercontinental dispersal of mammals between Asia and North America at several different times during the history. Some taxa have diverged considerably since their earlier residence in Beringia while other more recent inhabitants are still considered conspecific throughout their Holarctic distribution. Certain ground squirrels of the genus *Citellus* provide excellent models for the study of evolutionary relationships among past and present Beringian inhabitants. Chromosomes, electrophoretically separable hemoglobins, transferrins and isozymes, and cranial measurements examined by multivariate statistical techniques were compared in populations of Holarctic *Citellus parryi* (2n = 34) and in Asian *C. undulatus* and American *C. columbianus*, which both display 2n = 32. After isolation by the Bering Strait for 12,800 years *C. parryi* has maintained similar chromosomes, and one (G6PD) in 10 proteins has undergone a change in electrophoretic mobility, but skull morphology has diverged. In the *C. undulatus-C. columbianus* complex there was no chromosomal divergence and Glemsa band patterns substantiate homology after isolation for at least 100,000 years; however, during this time two in 11 proteins (transferrin and albumin) have differentiated and cranial divergence has been striking. These data are applied to a zoogeographic reappraisal of the arctic and long-tailed ground squirrel group. The applicability of chromosomal, biochemical and numerical taxonomic techniques to similar zoogeographic and evolutionary problems in Beringian species of *Microtus*, *Clethrionomys* and *Ovisis* [sic] is discussed.

Notes: Translation of *Beringiya v Kainozoe*, Vladivostok, 1976. Collection of papers presented at the All-Union Symposium "The Bering Land Bridge and its Role in the History of Holarctic Floras and Faunas in the Late Cenozoic" held at Khabarovsk in May, 1973.
Location: AEU POLAR 56:(*3) KON
Area: Beringia
Topics: Beringian land bridge connection, Genetics - *Citellus*, Zoogeography - *Citellus*, Genetics - *Spermophilus*, Zoogeography - *Spermophilus*, Genetics - *Microtus*, Genetics - *Ovis*, Genetics - *Clethrionomys*, Zoogeography - *Ovis*, Faunal remains - *Ovis*

Redmann, R. E.

1982 Production and Diversity in Contemporary Grasslands. In *Paleoecology of Beringia*, edited by D. M. Hopkins, J. V. Matthews Jr., C. E. Schweger and S. B. Young, pp. 223-239. Academic Press, New York, New York.

Primary productivity in arid grasslands and savannas is controlled mainly by drought; nutrient limitations are most apparent in more humid regions. The quantity and quality of herbage available to large grazers can fluctuate widely over the year due to drought and winter conditions. Woody browse species, important in the diets of most year-round resident herbivores, are present throughout the grasslands and savannas.

Removal of green plant tissue by herbivores may reduce primary production. Detrimental effects of herbivores often are counterbalanced by beneficial effects. Large herbivore consumption is small in some grasslands; much of the primary production passes to saprophagous organisms, or is consumed by fire.

Species diversity arises from competition and niche divergence along resource gradients. Two species cannot occupy the same niche; under equilibrium conditions, one must be excluded. Competitive exclusion in natural communities is not easy to measure or prove. Disturbances prevent competitive exclusion and result in the maintenance of diversity.

A review of field data, and a theory-based model show that, in general, primary production determines the large herbivore biomass that can be supported. Animal size and dominance are also important. Herbivore diversity can be high in communities with low productivity and low biomass, but only where dominance is prevented. Dominance tends to be strongest in tundra communities, and weakest in tropical grasslands and savannas. Diversity of large herbivores in temperate regions is based mainly on variety of habitat, which is most pronounced in mountainous and periglacial areas. Large-herbivore diversity in Beringia could have resulted from patterning in the vegetation due to physiographic, edaphic and microclimatic variations, as well as fire and the intensity of utilization by the herbivores themselves.

Location: AEU SCI QE 720 W47, AEA PMA/ASA 560.45 P174
Topics: Modern biogeography

Rogers, L. A., and R. A. Rogers

1987 Inbreeding and Wisconsin Glacial Barriers. Current Research in the Pleistocene 4:45-46.

Location: AEA PMA/ASA
Topics: Human migration, Human genetics, Ice-free corridor

Vorontsov, N. N., and E. A. Lyapunova

1986 Genetics and Problems of Trans-Beringian Connections of Holarctic Mammals. Translated by R. Chakravarty. In *Beringia in the Cenozoic Era*, edited by V. A. Kontrimavichus, pp. 441-463. Russian Translation Series No. 28. A. A. Balkema, Rotterdam, The Netherlands.

The authors discuss the theoretical background to the use of genetic methods for paleobiogeographic reconstruction. Phylogenetically, various systems involving genes, genomes, chromosomes and karyotypes have the advantage of being almost immune to convergence.

Convergence in boreal and arctic cenoses leads to similarity in the morphology of karyologically remote forms. Thus the following pseudoamphiberingian species were revealed: *Microtus* (s. str.) *agrestis*, 2n = 50, and *M.* (s. str.) *pennsylvanicus*, 2n = 46: *Stenocranius gregalis*, 2n = 36; *Microtus* (s. str.) *miurus*, 2n = 54; and *Sorex* from North America, 2n = 29/20, and Siberia, 2n = 32/36-36/37, the latter once assigned to the single arctic species, *S. arcticus*.

Genetic evidence has been obtained for the repeated existence of Beringian associations, exemplified by the distribution of the Palearctic genera *Marmota*, *Citellus* and *Ochotona*.

Genetically confirmed cases of Beringian associations of mammals are also examined in stratigraphic succession.

Pre-Pleistocene Beringian Associations. The affinity of karyotypes in forms with highly divergent morphology is shown. Thus the chromosomes of *Sciurus persicus* and the Sonorian *Sciurus* proved to be similar; at the same time, they differed sharply from the chromosomes of the boreal Sciuridae = *Citellus xanthoprimnus* and *C. vigilis*, *C. undulatus* and *C. columbianus*, *Ochotona pusilla* and *O. princeps* (2n = 68), *Marmota camtschatica* and *M. olympus* (2n = 40) proved to be related.

Pleistocene pre-Wisconsian Associations. Affinities between the following specifically independent Palearctic and Nearctic species are examined: *Ovis*; *Microtus agrestis* and *M. chrotorrhinus*; *Microtus middendorffi*, *M. hyperboreus* and *M. miurus*; and *Dicrostonyx* are examined.

Late Pleistocene Beringian Associations. Asiatic and American forms, e.g. *Citellus parryi*; *Marmota broweri* and *M. camtschatica*; *Microtus oeconomus*; and *Sorex cinereus* are shown to be conspecific or related.

Cases of intracontinental disjunctions of ranges in Wisconsin (*Ovis canadensis-Ovis dalli* and *Ochotona hyperborea*) are studied.

The directions of migrations were determined on the basis of genetic data. Early migration of *Ovis* with 2n = 56 was to North America, and late migration of *Ovis* with 2n = 54 to Siberia; the latter resulted in *O. nivicola* (2n = 52). Marmots migrated in the opposite direction. Thus, the first *Marmota* (2n = 54) moved to Siberia (*M. camtschatica*, 2n = 40), and then the progeny of the latter migrated to Alaska (*M. broweri*, 2n = 36). The vole *Microtus abbreviatus* came to St. Matthews from Alaska.

The gene frequency gradient is used to indicate the migration routes of *Citellus parryi* and *C. undulatus*. The genogeography of *C. parryi* transferrins is compared with the history of its range and distribution of fleas of the genus *Oropsylla*.

Notes: Figure numbers omitted from abstract. Translation of *Beringiya v Kainozoe*, Vladivostok, 1976. Collection of papers presented at the All-Union Symposium "The Bering Land Bridge and its Role in the History of Holarctic Floras and Faunas in the Late Cenozoic" held at Khabarovsk in May, 1973.

Location: AEU POLAR 56:(*3) KON

Area: Beringia, Siberia

Topics: Genetics - *Microtus*, Genetics - *Sorex*, Genetics - *Marmota*, Genetics - *Citellus*, Genetics - *Ochotona*, Genetics - *Ovis*, Genetics - *Dicrostonyx*, Faunal migration, Zoogeography - insects, Beringian land bridge connection

SECTION B. EASTERN BERINGIA - ALASKA, YUKON AND NORTHWEST TERRITORIES

PART 1. GENERAL

Bobrowsky, P., and N. W. Rutter

1992 The Quaternary Geologic History of the Canadian Rocky Mountains. Géographie physique et Quaternaire 46:5-50.

The Canadian Rocky Mountains figured prominently during the glacial history of western Canada. First as a western limit or boundary to the Laurentide Ice Sheet, second as an eastern margin of the Cordilleran Ice Sheet, and finally as a centre of local Montane ice. Throughout the Quaternary, complex interactions of glacier ice from these three ice sources markedly changed the physical form of the Rocky Mountains, Trench and Foothills areas. Investigations into the Quaternary history of this region have been ongoing since the beginning of the last century. Since about 1950, the number of studies performed in this area have increased significantly. This paper briefly reviews the historical accomplishments of Quaternary work in the region up to the period of about 1950. From this time to the present, individual study efforts are examined in detail according to the three geographic regions: 1) the northern Rocky Mountains (from the Liard Plateau south to the McGregor Plateau), 2) the central Rocky Mountains (from the McGregor Plateau south to the Porcupine Hills) and 3) the southern Rocky Mountains (from the Porcupine Hills south to the international border). In the northern region, geologic data suggest a maximum of two Rocky Mountain glaciations and only one Laurentide glaciation and no ice coalescence. In the central region, three of four Rocky Mountain events, and at least two Laurentide events are known. Only in the central region is there good evidence for ice coalescence but the timing of this event is not clearly established. In the south, at least three Rocky Mountain episodes and a variable number of Laurentide episodes are recognized. There is no evidence for ice coalescence. A number of facts support the proposal that Cordilleran ice crossed the Continental Divide and joined with local Montane ice at several locations. However, this expansion of western ice occurred before the Late Wisconsinan in all areas but Jasper. In general, the chronological data presented suggest that the Late Wisconsinan glaciation in the Rocky Mountains was a short-lived event which started around or after 20 ka years ago and ended before 12 ka ago.

Location: AEU SCI G 1 R452
Area: British Columbia - northeastern, Alberta - northwestern
Topics: Tephra - Mazama, Glacial geomorphology, Dating - analysis of radiocarbon dates, Review of glacial history - Rocky Mountains, Review of stratigraphy - Rocky Mountains, Review of vegetation history - Rocky Mountains, Plant macrofossils, Palaeontological sites - Rocky Mountains, Archaeological sites - Rocky Mountains

Frison, G. C., and D. N. Walker

1990 New World Palaeoecology at the Last Glacial Maximum and the Implications for New World Prehistory. In *The World at 18 000 BP, Volume 1, High Latitudes*, edited by O. Soffer and C. Gamble, pp. 312-330. Unwin Hyman, London, England.

Location: AEU HSS GN 741 W928
Area: Eastern Beringia
Topics: Cultural traditions, Human migration, Archaeological sites - Eastern Beringia, Palaeontological sites - Old Crow, Bone modification, Taphonomy, Ice-free corridor, Glacial history - Eastern Beringia, Glacial lake sequences, Sea level changes, Vegetation history - Eastern Beringia, Climate history - Eastern Beringia, Faunal remains - Eastern Beringia, Faunal associations

Hoffecker, J. F., C. F. Waythomas, and W. R. Powers

1988 Late Glacial Loess Stratigraphy and Archaeology in the Nenana Valley, Central Alaska. Current Research in the Pleistocene 5:83-86.

Location: AEA PMA/ASA
Area: Eastern Beringia, Alaska - central

Topics: Stratigraphy, Loess, Lithics, Glacial history, Palaeosols, Pollen records - Alaska, Faunal remains - Alaska, Archaeological sites - Alaska, Dating - TL, Magnetic susceptibility

Hopkins, D. M., R. E. Giterman, and J. V. Matthews Jr.

1976 Interstadial Mammoth Remains and Associated Pollen and Insect Fossils, Kotzebue Sound Area, Northwestern Alaska. Geology 4:169-172.

A proboscidian (mammoth or mastodon) skeleton from the Baldwin Peninsula, northwestern Alaska, is associated with plant remains 26,900 (+2,400,-3,400) C^{14} yr old (AU-90). Pollen from the same level records shrub tundra dominated by dwarf birch, sedges, and grasses; spruce pollen is lacking, and alder is represented only by a few stray grains, indicating that forest vegetation lay hundreds of kilometres away. The radiocarbon age and the pollen spectrum suggest that the animal lived during a late Wisconsinan interstadial interval equivalent to the Plum Point Interstade of the Great Lakes region of North America and the final mild episode of the Kargin Interstade of northwestern Siberia.

Location: AEU SCI QE 1 G3455
Area: Eastern Beringia, Alaska - northwestern
Topics: Stratigraphy, Faunal remains - *Mammuthus primigenius*, Plant macrofossils, Plant macrofossils - *Potamogeton* seeds, Insect macrofossils, Pollen analysis

Hughes, O. L., C. R. Harington, J. A. Janssens, J. V. Matthews Jr., R. E. Morlan, N. W. Rutter, and C. E. Schweger

1981 Upper Pleistocene Stratigraphy, Paleoecology, and Archaeology of the Northern Yukon Interior, Eastern Beringia 1. Bonnet Plume Basin. Arctic 34:329-365.

New stratigraphic and chronometric data show that Bonnet Plume Basin, in northeastern Yukon Territory, was glaciated in late Wisconsinan time rather than during an earlier advance of Laurentide ice. This conclusion has important ramifications not only for the interpretation of all-time glacial limits farther north along the Richardson Mountains but also for non-glaciated basins in the Porcupine drainage to the northwest. The late Wisconsinan glacial episode in Bonnet Plume Basin is here named the Hungry Creek advance after the principal Quaternary section in the basin. Sediments beneath the till at Hungry Creek have produced well-preserved pollen, plant macrofossils, insects, and a few vertebrate remains. The plant and invertebrate fossils provide a detailed, if temporally restricted, record of a portion of the mid-Wisconsinan interstadial, while the vertebrate fossils include the oldest Yukon specimen of the Yukon wild ass. Some of the mid-Wisconsinan sediments have also yielded distinctive chert flakes that represent either a previously unreported product of natural fracturing or a by-product of stone tool manufacture by human residents of Bonnet Plume Basin.

In addition to presenting new data on these diverse but interrelated topics, this paper serves as an introduction to a series of reports that will treat in turn the Upper Pleistocene record of Bluefish, Old Crow, and Bell basins, respectively.

Location: AEU SCI G 600 A67
Area: Yukon - northern, Eastern Beringia
Topics: Glacial history - Yukon, Glacial geomorphology, Dating - amino acid, Stratigraphy, Plant macrofossils, Plant macrofossils - *Picea*, Insect macrofossils, Lithics, Faunal remains - Yukon, Archaeological sites - Yukon, Pollen analysis - Yukon, Plant macrofossils - bryophytes, Plant macrofossils - *Picea* needles, Plant macrofossils - *Carex*, Plant macrofossils - *Najas flexilis*, Plant macrofossils - *Brasenia schreberi*, Plant macrofossils - *Polygonum lapathifolium*, Insect macrofossils - beetles, Insect macrofossils - arachnids, Faunal remains - *Spermophilus*, Faunal remains - *Dicrostonyx*, Faunal remains - *Lemmus*, Faunal remains - *Microtus*, Faunal remains - *Equus*, Molluscs, Plant macrofossils - seeds, Lithics

Irving, W. N., and B. F. Beebe

1984 *Northern Yukon Research Programme Director's Report 1975-80.* University of Toronto Anthropological Series: Number 15. 181 pp.

Notes: Contains list of NYRP publications.
Location: AEU HSS QE 748 Y8 I72

Area: Eastern Beringia, Yukon - northern
Topics: Palaeontological sites - Old Crow, Archaeological sites - Bluefish Caves, Archaeological sites - Eastern Beringia, Faunal remains - Yukon, Stratigraphy, Geoarchaeology, Beringian ecology, Pollen analysis - Yukon, Glacial history - Yukon

Morlan, R. E.

1981 Big Bones and Tiny Stones: Early Evidence from the Northern Yukon Territory. In *Comision XII, El Poblamiento de América, Coloquio, Evidencia arquelógica de ocupación humana en América anterior a 11,500 años a.p.*, edited by A. Bryan, pp. 1-26. Union International de Ciencias Prehistoricas Y Protohistoricas, X Congreso, Mexico, Octubre 19-24, 1981.

Location: AEU HSS GN 701 P97
Area: Eastern Beringia, Yukon - northern
Topics: Glacial history - Yukon, Stratigraphy, Tephra - Old Crow, Periglacial features - fossil ice wedges, Plant macrofossils - wood, Loess, Bone modification, Taphonomy, Pollen records - Yukon, Faunal remains - *Mammuthus primigenius*, Faunal remains - *Spilogale*, Faunal remains - *Marmota monax*, Dating - analysis of radiocarbon dates, Lithics, Human migration, Palaeontological sites - Old Crow

Péwé, T. L.

1976 Late Cenozoic History of Alaska. In *Quaternary Stratigraphy of North America*, edited by W. C. Mahaney, pp. 493-506. Dowden, Hutchinson & Ross, Inc., Stroudsburg, Pennsylvania.

The events of the last 10 million years form a geological, biogeographical, and climatological history of Alaska during the development of modern landscapes, vegetation patterns, and faunal distributions, and the coming of man. Landscapes have been identified that, at one time, were forested, with glaciers mere pockets of ice in the high mountains; at another time landscapes were dominated by a tundra vegetation, disrupted by wide, braided glacial streams from which sand and dust were blown, and magnificent glaciers flowed from the ranges, spreading piedmont ice sheets on the lowlands. Climates varied from those colder than now when ice wedges and permafrost existed even in southern Alaska, to climates when permafrost was essentially absent in central Alaska and conditions were more equable than now in most of the State. A review of the Late Cenozoic history can be pieced together from large and small fragments of information concerning the past 2-5 m.y. in Alaska. This history reveals controversies and paradoxes in a chronological review of events of late Cenozoic time and points up problems that remain to be solved. Quaternary vulcanism is not treated. ...

Notes: Introduction used as abstract.
Location: AEU SCI QE 696 Q25
Area: Eastern Beringia, Alaska
Topics: Review of glacial history - Alaska, Treeline fluctuations, Review of climate history - Alaska, Vegetation history - Alaska, Plant macrofossils - peat, Refugia, Periglacial features, Faunal remains - Alaska, Sea level changes

Péwé, T. L., D. M. Hopkins, and J. L. Giddings

1965 The Quaternary Geology and Archaeology of Alaska. In *The Quaternary of the United States*, edited by H. E. Wright Jr. and D. G. Frey, pp. 355-374. Princeton University Press, Princeton, New Jersey.

Quaternary deposits mantle virtually all of Alaska. About 50% is covered by glacial deposits and the rest by deposits of eolian, fluvial, lacustrine, volcanic, periglacial, and marine origin. Local patches of early Pleistocene till are found in most of the glaciated areas. During Illinoian, Wisconsin, and Recent times glaciers were much more extensive in southern Alaska than in northern Alaska and were nourished chiefly by air masses moving north- to northeastward from the northern Pacific Ocean. The Wisconsin glaciation in Alaska was clearly a complex event, consisting of at least two major advances and including several minor oscillations during the later major advance.

Eolian deposits cover much of the low-lying parts of Alaska and are mostly of late Pleistocene age. Quaternary lacustrine deposits are relatively scarce but about 25% of the state is covered with fluvial deposits. Marine deposits are confined mostly to a coastal fringe in northern and western Alaska.

Perennially frozen ground is present throughout most of Alaska; ice wedges are widespread in northern Alaska and fairly common in central Alaska. Periglacial deposits occur throughout the state. Alaska provides examples of both actively forming and the inactive or "fossil" periglacial deposits.

The native populations of Alaska consist of the Eskimos, who occupy the coasts of the Arctic Ocean, Bering and Chukchi Seas, and the Pacific Coast west of Cordova; the Aleuts of the Aleutian Islands, who speak an aberrant Eskimo sub-language; the Athapascan-speaking Indians of the inland forests; and the Indians of the Pacific Coast east of Cordova, who speak another language of the Na-Dene stock. Numerous excavated archaeological sites provide a long and detailed record of the evolution of Eskimo and Aleut cultures, but archaeological knowledge of the pre-history of the Indian groups is scanty.

The oldest Aleut site recognized thus far is at Anangula Island, occupied as early as 8,400 years ago. The nearby Chaluka Site on Umnak Island shows continuity of a single way of life throughout the past 4,000 years, in spite of physical changes in the population and style changes in their artifacts.

The oldest well-dated Eskimo culture is represented by the Denbigh Flint Complex, characterized by microblades and cores of the Old World Mesolithic style, bi-faced side blades and end blades, and abundant burins found in deposits about 5,000 years old. Related cultural assemblages are widely distributed in western and northern Alaska and eastward across Canada to northernmost Greenland. Later cultural assemblages from the Eskimo area show greater changes with time and greater local differentiation than has been recognized thus far in Aleut sites.

A few artifact assemblages from western and northern Alaska may be of late-Pleistocene age and may represent Indian rather than Eskimo manifestations.

Notes: Summary used as abstract. A review volume for the VII INQUA Congress, Boulder and Denver.
Location: AEU SCI QE 77 W94
Area: Eastern Beringia, Alaska, Aleutian Islands, St. Lawrence Island
Topics: Review of glacial history - Alaska, Review of archaeology - Alaska, Archaeological sites - Anangula, Archaeological sites - Alaska, Lithics, Periglacial features, Permafrost, Loess, Ice limit reconstruction, Dating - uranium series, Glacial lake sequences, Sea level changes, Glacial geomorphology, Geomorphology - dunes, Molluscs - marine, Bone modification, Cultural traditions, Lithic affinities, Burials

Pielou, E. C.

1991 ***After the Ice Age: The Return of Life to Glaciated North America.*** **University of Chicago Press, Chicago, Illinois. 366 pp.**

Location: AEU SCI QE 721.2 P24 P613, AEU POLAR 56:(7) PIE
Area: Eastern Beringia
Topics: Review of glacial history - Eastern Beringia, Refugia, Sea level changes, Review of palaeoenvironmental studies - Eastern Beringia, Glacial lake sequences, Faunal remains, Insect macrofossils, Plant macrofossils, Biogeography, Zoogeography, Pollen records, Faunal extinction, Archaeology

PART 2. LATE QUATERNARY GEOLOGY

Beget, J.

1989 Was the Late Pleistocene Northwest Laurentide Ice Sheet Wet-Based? In *Late Cenozoic History of the Interior Basins of Alaska and the Yukon*, edited by L. D. Carter, T. D. Hamilton and J. P. Galloway, pp. 22-24. Circular 1026. United States Geological Survey.

Location: AEU SCI QE 75 C57
Area: Eastern Beringia, Northwest Territories, Yukon
Topics: Glacial history, Glacial dynamics

Beget, J. E., D. Pinney, and N. Bigelow

1991 Tephrochronology of the Pleistocene-Holocene Transition in Alaska. In *INQUA, 13th International Congress, Beijing, China, Abstracts*, p. 21.

Area: Alaska, Eastern Beringia
Topics: Tephra - Alaska, Dating - tephra, Stratigraphy

Begét, J.

1990 Middle Wisconsinan Climate Fluctuations Recorded in Central Alaskan Loess. Géographie physique et Quaternaire 44:3-13.

Fluctuations in Middle Wisconsinan environments are recorded in high resolution proxy climatic curves derived from magnetic susceptibility profiling of central Alaskan loess. Two intervals of low wind intensity and climatic amelioration, separated by a period of somewhat higher wind intensity, can be recognized in several loess records of the Middle Wisconsinan. Radiocarbon dates from loess in the Fox Permafrost Tunnel indicate that the culmination of the later period of low wind intensity occurred *ca.* 30-32,000 yr BP, and was associated with thermal degradation of permafrost. An older period of low wind intensity early in the Middle Wisconsinan, *ca.* 50-60,000 yr BP, is correlative with a fossil wood horizon in the permafrost tunnel and a widespread paleosol in loess sections. Warm intervals of similar age are recorded in the Grande Pile pollen record, in ice cores and in marines cores. The 30-32,000 yr BP and the 50-60,000 yr BP warm events recorded in Alaskan loess sequences may have been caused by "greenhouse" warming produced by transient increases in atmospheric CO_2 as recorded in the Vostok ice core. A Middle Wisconsinan interval of higher wind intensity, associated with the development of ice wedges, may reflect climatic cooling due to low atmospheric CO_2 values *ca.* 42,000 yr BP.

Location: AEU SCI G 1 R452
Area: Eastern Beringia, Alaska - central
Topics: Loess, Palaeowinds, Magnetic susceptibility, Climate history - Alaska

Begét, J., M. Edwards, D. Hopkins, M. Keskinen, and G. Kukla

1991 Old Crow Tephra Found at the Palisades of the Yukon, Alaska. Quaternary Research 35:291-297.

A 20-cm-thick volcanic ash layer at the Palisades along the Yukon River is geochemically correlated with the Old Crow tephra. A buried organic and wood-rich layer above the Old Crow tephra probably records the last interglaciation. The recognition of the Old Crow tephra provides the first chronologic information on the age of the thick sequence of Pleistocene sediments at the Palisades, an important ice-age mammal site in central Alaska and a key locality for the reconstruction of the history of the Yukon River and the last interglaciation in central Alaska.

Location: AEU SCI QE 696 Q24
Area: Eastern Beringia, Alaska - central
Topics: Tephra - Old Crow, Tephra - composition, Plant macrofossils - wood, Stratigraphy, Loess

Berger, G. W.

1987 Thermoluminescence Dating of the Pleistocene Old Crow Tephra and Adjacent Loess, near Fairbanks, Alaska. Canadian Journal of Earth Sciences 24:1975-1984.

Two different thermoluminescence (TL) techniques have produced an average age of 109 ± 14 ka for the widespread Pleistocene Old Crown [sic] tephra, previously of uncertain age. A deposit of the tephra from the Halfway House site at Fairbanks, Alaska, was dated directly at 110 ± 12 ka by analyses of 4 - 11 μm glass, using the additive-dose TL technique. A lower age limit of 108 ± 16 ka for this tephra was obtained indirectly by analysis of 4 - 11 μm grains of loess just above it, using the partial-bleach TL technique.

For this partial-bleach technique, the assumptions of "zeroing" of TL and of the saturating exponential form of the TL growth curves were checked by analyses of a surface loess deposited within the last century. Also, most or all of an unstable (anomalous fading) TL component was eliminated from the older polymineralic loess in only a few days by storing irradiated subsamples at elevated temperatures. In contrast, several months storage was required to achieve the same effect at room temperature for this sample.

Location: AEU SCI QE 1 C212
Area: Eastern Beringia, Alaska, Yukon
Topics: Tephra - Old Crow, Dating - TL methodology, Loess - dating

Bigelow, N., J. Begét, and R. Powers

1990 Latest Pleistocene Increase in Wind Intensity Recorded in Eolian Sediments from Central Alaska. Quaternary Research 34:160-168.

A brief increase in wind intensity between ca. 11,100 and 10,700 yr B.P. is recorded by a sharp increase in sediment grain size at eolian sections along the Nenana River in central Alaska. This occurred at the same time as the Younger Dryas climatic reversal in northern Europe and an increase in the vigor of atmospheric circulation recorded by Greenland ice cores. Climatic fluctuations in high latitude areas during Younger Dryas time may reflect variations in the CO_2 content of the atmosphere.

Location: AEU SCI QE 696 Q24
Area: Eastern Beringia, Alaska - central
Topics: Stratigraphy, Loess, Palaeowinds, Climate history - Alaska, Archaeological sites - Walker Road, Archaeological sites - Dry Creek, Geoarchaeology, Aeolian deposits, Dating - analysis of radiocarbon dates

Bobrowsky, P. T.

1988 Ice Free Conditions in the Northern Canadian Cordillera at 18 KA and Timing of the Late Wisconsinan. In *AMQUA, 10th Biennial Meeting, Amherst, Massachusetts, Program and Abstracts*, p. 108.

Location: AEU HSS QE 696 A5212
Area: Eastern Beringia, British Columbia - northeastern
Topics: Plant macrofossils - wood, Glacial history, Ice-free corridor

1991 Quaternary Geology of the Northern Rocky Mountains and Foothills of Western Canada. In *INQUA, 13th International Congress, Beijing, China, Abstracts*, p. 29.

Area: British Columbia - northeastern, Eastern Beringia
Topics: Glacial history, Stratigraphy, Glacial geomorphology

Bobrowsky, P. T., D. G. E. Liverman, and N. Catto

1993 Geological Constraints Regarding the Ice-Free-Corridor in Northeastern British Columbia and Northwestern Alberta. In *GAC/MAC Joint Annual Meeting, Edmonton, Program and Abstracts*, Vol. 18, p. A-10.

Location: AEU SCI QE 1 G333
Area: British Columbia - northeastern
Topics: Glacial history, Ice-free corridor

Bombin, M.

1980 Early and Mid-Wisconsinan Paleosols in the Old Crow Basin (Yukon Territory, Canada). In *AMQUA, 6th Biennial Meeting, Orono, Maine, Abstracts and Program*, pp. 37-39.

Location: AEU HSS QE 696 A5212
Area: Eastern Beringia, Yukon - northern
Topics: Palaeontological sites - Old Crow, Stratigraphy, Palaeosols, Periglacial features - fossil ice wedges

Briggs, N. D., and J. A. Westgate

1978 Fission-Track Age of Tephra Marker Beds in Beringia. In *AMQUA, 5th Biennial Meeting, Edmonton, Alberta, Abstracts*, p. 190.

Location: AEU HSS QE 696 A5212
Area: Eastern Beringia, Yukon
Topics: Tephra - fission track dating, Tephra - Old Crow, Glacial history, Stratigraphy, Dating - fission track

Brigham, J. K.

1984 Marine Stratigraphy and Amino Acid Geochronology of the Gubik Formation, Western Arctic Coastal Plain, Alaska. In *The United States Geological Survey in Alaska: Accomplishments During 1982*, edited by K. M. Reed and S. Bartsch-Winkler, pp. 5-9. Circular 939. United States Geological Survey.

Location: AEU SCI QE 75 C57
Area: Eastern Beringia, Alaska - northern
Topics: Dating - amino acid, Ostracodes, Stratigraphy, Sea level changes, Molluscs, Plant macrofossils - wood

Brouwers, E., L. Marincovich Jr., and D. M. Hopkins

1984 Paleoenvironmental Record of Pleistocene Transgressive Events Preserved at Skull Cliff, Northern Alaska. In *The United States Geological Survey in Alaska: Accomplishments During 1982*, edited by K. M. Reed and S. Bartsch-Winkler, pp. 9-12. Circular 939. United States Geological Survey.

Location: AEU SCI QE 75 C57
Area: Eastern Beringia, Alaska - northern
Topics: Ostracodes, Stratigraphy, Sea level changes, Molluscs

Carter, L. D.

1981 A Pleistocene Sand Sea on the Alaskan Arctic Coastal Plain. Science 211:381-383.

A ridge and thermokarst-basin landscape that is strikingly portrayed in Landsat winter imagery consists of large Pleistocene dunes that have been modified by younger eolian activity and thermokarst processes. This is the most extensive area of large stabilized dunes yet reported in the North American Arctic; the landscape is of particular interest because it has been proposed as a first-order analog for martian fretted terrain. Recognition of the large dunes permits a new interpretation for linear and curvilinear trends visible in Landsat summer imagery.

Location: AEU SCI Q 1 S41
Area: Eastern Beringia, Alaska - northern
Topics: Remote sensing - LANDSAT, Aeolian deposits, Sedimentology - dunes, Palaeowinds, Stratigraphy, Faunal remains - *Bison*, Plant macrofossils

Carter, L. D., and S. W. Robinson
1978 Radiocarbon-Dated Episodes of Activity and Stabilization of Large Dunes, Arctic Coastal Plain, Alaska. In *AMQUA, 5th Biennial Meeting, Edmonton, Alberta, Abstracts*, p. 192.

Location: AEU HSS QE 696 A5212
Area: Eastern Beringia, Alaska - northern
Topics: Aeolian deposits, Loess, Plant macrofossils - wood, Plant macrofossils - peat, Palaeowinds, Geomorphology - dunes

Catto, N. R.
1986 *Quaternary Sedimentology and Stratigraphy, Peel Plateau and Richardson Mountains, Yukon and N.W.T.* Unpublished Ph.D. dissertation. Department of Geology, University of Alberta, Edmonton, Alberta. xxiii + 728 pp. (2 volumes).

Quaternary sediments exposed throughout the Peel Plateau and Richardson Mountains in the western portion of the Northwest Territories and northeastern Yukon record a succession of glacial, fluvial, and lacustrine events. The oldest unconsolidated sediments are preglacial fluvial gravels of unknown age, exposed along tributaries of the Peel River. The oldest glacial event in the region is recorded by the intensely weathered granite-bearing Brown Bear gravels exposed along the Peel River. These sediments are also of unknown age.

A second glaciation is documented by till exposed along the Snake River, and by glaciotectonically deformed sediments in the central Peel Plateau. This event is correlated to the Deception lacustrine sediments in the Bonnet Plume Basin, and pre-dates 40,000 B.P.

The final glacial event was the most areally extensive to affect the region. Sediments formed during this event are correlated to the Hungry Creek and Buckland glaciations recognized west and north of the Peel Plateau. This glaciation commenced after 31,000 B.P. Deglaciation commenced at some time prior to 22,000 B.P., and resulted in the development of lacustrine sequences in the Rat and Caribou River valleys.

The region was deglaciated by 12,000 B.P. The postglacial environment has been characterised by the development of braided-meandering streams, periglacial activity, and the re-establishment of tundra and taiga vegetation.

Location: AEU SP COLL 86-14D
Area: Yukon - northern, Northwest Territories - western, Eastern Beringia
Topics: Glacial history - Yukon, Glacial history - Northwest Territories, Glacial lake sequences, Periglacial features, Stratigraphy

Crumley, S. G., D. B. Stone, and J. Beget
1991 Characterization of Magnetic Minerals in some Alaskan Loess: Implications for Paleoclimatology. In *INQUA, 13th International Congress, Beijing, China, Abstracts*, p. 69.

Area: Alaska, Eastern Beringia
Topics: Loess, Magnetic susceptibility, Archaeological sites - Dry Creek

Denton, G. H.
1970 Late Wisconsin Glaciation in Northwestern North America: Ice Recession and Origin of Paleo-Indian Clovis Complex. In *AMQUA, 1st Biennial Meeting, Abstracts*, pp. 34-35.

Location: AEU HSS QE 696 A52
Area: Alaska, Eastern Beringia
Topics: Glacial history, Climate history, Human migration, Ice-free corridor, Sea level changes

1974 Quaternary Glaciations of the White River Valley, Alaska, with a Regional Synthesis for the Northern St. Elias Mountains, Alaska and Yukon Territory. Geological Society of America Bulletin 85:871-892.

During Quaternary ice ages, a complex piedmont glacier repeatedly formed north of the St. Elias Mountains in Yukon Territory and Alaska. During the Macauley glaciation (the youngest), the White River valley in Alaska served as a conduit of ice that filled the valley to thicknesses of 850 to 1,150 ft (256 to 351 m) and flowed eastward into Yukon Territory, where it fed the western margin of the Macauley piedmont glacier. C^{14} dates fail to pinpoint Macauley expansion in the valley, but they do indicate deglaciation by 11,270 yr B.P. and subsequent spruce immigration by 8,020 yr B.P. On as many as five occasions prior to 37,000 yr B.P., pre-Macauley ice filled the valley; on at least three occasions, it spilled northward over the valley rim.

Along its upper surface, Macauley drift in the White River valley and in the adjacent Snag-Klutlan area can be traced into Kluane Drift exposed farther east near Kluane Lake, thus permitting reconstruction of the Macauley-Kluane piedmont glacier. Near Kluane Lake, the main Kluane ice advance postdated 29,600 yr B.P., but the initial Macauley advance in the Snag-Klutlan area is not associated with finite C^{14} dates. The maximum Macauley-Kluane ice extent was attained near Snag about 14,000 yr B.P.; subsequent recession was very rapid. Prior to the Kluane glaciation, Shakwak Trench was deglaciated to the vicinity of Kluane Lake during the Boutellier nonglacial interval (<29,000 to >49,000 yr B.P). Whether similar recession characterized the Snag-Klutlan area and White River valley is not known. The earlier Icefield glaciation (>49,000 yr B.P. near Kluane Lake) correlates with, or is younger than, the Mirror Creek glaciation (>38,000 yr B.P. in the Snag-Klutlan area). The still older Silver nonglacial interval and the Shakwak glaciation in the Kluane Lake area cannot be correlated now with other St. Elias events. Nor can pre-Macauley glaciations in the White River valley be correlated yet on a regional basis.

The most striking late Wisconsin event in the St. Elias Mountains was the nearly complete disintegration of the Macauley-Kluane ice within only 1,500 to 2,700 yr after attaining its maximum about 14,000 yr B.P. Several other alpine glacier systems in cordilleran North and South America showed similar rapid recession, as did larger ice sheets to a less marked degree. Quite possibly, the behavior of these sensitive alpine glaciers reflects an abrupt background climatic event that essentially terminated the late Wisconsin glaciation shortly after 14,000 yr ago. These data indicate that Termination I of Broecker and van Donk (1970) began shortly after 14,000 yr B.P.

The glacial chronology of the northern St. Elias Mountains suggests that early man could have inhabited Shakwak Trench, perhaps using it as a route to British Columbia or coastal southeastern Alaska, during the Boutellier nonglacial interval, and again by 11,000 to 12,000 yr B.P. at the end of the Kluane-Macauley glaciation.

Notes: References not included in abstract.
Location: AEU SCI QE 1 G341
Area: Eastern Beringia, Yukon - southwestern, Alaska - southeastern
Topics: Dating - analysis of radiocarbon dates, Glacial history - Yukon, Glacial geomorphology, Stratigraphy, Plant macrofossils - wood, Plant macrofossils - peat, Climate history - Yukon, Human migration

Denton, G. H., and M. Stuiver

1967 Late Pleistocene Glacial Stratigraphy and Chronology, Northeastern St. Elias Mountains, Yukon Territory, Canada. Geological Society of America Bulletin 78:485-510.

Drift morphology and stratigraphic relations of drift sheets and weathering zones indicate four glaciations separated by three nonglacial intervals in the northeastern St. Elias Mountains, Yukon Territory, Canada. Ice of the two oldest glaciations (Shakwak and Icefield) flowed through Slims River valley into Shakwak Valley near Kluane Lake. Ice of the subsequent glaciation (Kluane) entered Shakwak Valley through valleys draining the Icefield Ranges, flowed northwest along Shakwak Valley with a thickness locally exceeding 3530 feet, and terminated in the vicinity of Snag near the Yukon-Alaska boundary. The last glaciation (Neoglaciation) was much more restricted. During the two oldest nonglacial intervals (Silver and Boutellier), Shakwak Valley was ice-free; during the third nonglacial interval (Slims), ice receded more than 13 miles upvalley from the present Kaskawulsh Glacier terminus.

Twenty C^{14} dates combine to give the following late Pleistocene chronology in the areas studied: Shakwak glaciation (>49,000 B.P.), Silver nonglacial interval (>49,000 B.P.), Icefield glaciation (start >49,000 B.P., end approximately 37,700 B.P.), Boutellier nonglacial interval (start approximately 37,700 B.P., end <30,100 B.P.), Kluane glaciation (start <30,100 B.P., end approximately 12,500-9780 B.P.), Slims nonglacial interval (start approximately 12,500-9780 B.P., end approximately 2640 B.P.), Neoglaciation (start approximately 2640 B.P., still current).

Comparison of C^{14}-dated glacial events in Yukon-Alaska (as recorded in the St. Elias Mountains and in the Brooks Range) with glacial events in Washington and British Columbia, pluvial events at Searles Lake, California, and fluctuations of the Laurentide Ice Sheet in the Great Lakes region suggests, with reservations, that some major late Wisconsin climatic fluctuations in Yukon-Alaska and these other regions were broadly synchronous. However, sufficient detail is not yet available to make firm conclusions about correlation of minor climatic fluctuations during these times.

Location: AEU SCI QE 1 G341
Area: Eastern Beringia, Yukon - southwestern
Topics: Dating - analysis of radiocarbon dates, Glacial history - Yukon, Glacial geomorphology, Stratigraphy, Plant macrofossils - wood, Plant macrofossils - peat, Soil, Palaeosols

Duk-Rodkin, A., and O. L. Hughes

1991 Age Relationships of Laurentide and Montane Glaciations, Mackenzie Mountains, Northwest Territories. Géographie physique et Quaternaire 45:79-90.

The Mackenzie Mountains were glaciated repeatedly by large valley glaciers that emanated from the Backbone Ranges, and by much smaller valley glaciers that emanated from peaks in the Canyon Ranges. During the Late Wisconsinan the Laurentide Ice Sheet reached its all-time maximum position. The ice sheet pressed against the Canyon Ranges and moved up major valleys causing the diversion of mountain waters and organizing a complex meltwater system that drained across mountain interfluve areas towards the northwest. Two ages of moraines deposited by montane glaciers occur widely in the Mackenzie Mountains. Near the mountain front certain of the older moraines have been truncated by the Laurentide Ice Sheet, and others have been incised by meltwater streams emanating from the Laurentide ice margin, indicating that these older moraines predate the maximum Laurentide advance. Locally, certain of the younger montane moraines breach moraines and other ice marginal features of the Laurentide maximum, indicating that the younger montane glaciation post-dated the Laurentide maximum. Some large montane glaciers extended out from the mountains to merge with the retreating Laurentide Ice Sheet. There are several localities that display the age relationships between montane and Laurentide glaciations such as Dark Rock Creek, Durkan-Lukas Valley, Little Bear River and Katherine Creek. The older of the local montane glaciations is correlated tentatively with Reid Glaciation (Illinoian?) of central Yukon, and the younger with the Late Wisconsinan McConnell Glaciation. The Laurentide Glaciation is correlated with Hungry Creek Glaciation of Bonnet Plume Depression, which probably culminated about 30,000 years ago or somewhat later.

Location: AEU SCI G 1 R452
Area: Eastern Beringia, Northwest Territories - western
Topics: Glacial history - Northwest Territories, Stratigraphy, Glacial geomorphology - moraines, Glacial geomorphology - meltwater channels, Erratics

1992 Pleistocene Montane Glaciations in the Mackenzie Mountains, Northwest Territories. Géographie physique et Quaternaire 46:69-83.

During the Pleistocene the Mackenzie Mountains were affected by a series of glaciations. Through all the glaciations a single pattern seems to have been repeated: a Cordilleran ice sheet formed to the west of the continental divide and montane valley glaciers formed to the east. The montane glaciers in the Mackenzie Mountains emanated from two differents [sic] sources: a) a glacial divide, lying generally along the topographic divide between Pacific and Arctic drainage, and dividing the westerly flowing Cordilleran Ice Sheet from easterly and northerly flowing montane glaciers, b) local peaks in the Canyon Ranges. There were two well defined glacial advances in this mountain region: Illinoian, Late Wisconsinan, and one or more less defined pre-Illinoian glaciation(s). Illinoian and Late Wisconsinan glaciations are herein named Mountain River and Gayna River glaciations respectively. These advances are usually identifiable in valleys by frontal and segments of lateral moraines and glacial erosional features. Pre-Illinoian glaciation(s) have been recognized so far only in stratigraphic sections. The older advances were more extensive than the Gayna River advance; associated deposits occur higher on the valley sides and further down the valley than those associated with Gayna River Glaciation. During Mountain River Glaciation some of the montane glaciers in the Canyon Ranges merged to form piedmont glaciers. In contrast, during Gayna River Glaciation, the local glaciers consisted of single tongues, and these were mostly restricted to tributary valleys that had northward facing cirques.

Location: AEU SCI G 1 R452
Area: Eastern Beringia, Northwest Territories - western
Topics: Glacial history - Northwest Territories, Stratigraphy, Palaeosols, Glacial geomorphology

1993 Mackenzie River, an Integrated Drainage System of Late Pleistocene Age. In *GAC/MAC Joint Annual Meeting, Edmonton, Program and Abstracts*, Vol. 18, p. A-24.

Location: AEU SCI QE 1 G333
Area: Eastern Beringia, Northwest Territories - western
Topics: Palaeochannels, Glacial history

Duk-Rodkin, A., and L. Jackson

1993 Late Wisconsinan Glaciation and the Ice Free Corridor. In *GAC/MAC Joint Annual Meeting, Edmonton, Program and Abstracts*, Vol. 18, p. A-25.

Location: AEU SCI QE 1 G333
Area: Eastern Beringia, Yukon, Northwest Territories
Topics: Glacial history, Ice-free corridor, Human migration

Duk-Rodkin, A., L. E. Jackson Jr., and O. Rodkin

1986 A Composite Profile of the Cordilleran Ice Sheet During McConnell Glaciation, Glenlyon and Tay River Map Area, Yukon Territory. In *AMQUA, 9th Biennial Meeting, Champaign, Illinois, Program and Abstracts*, p. 130.

Location: AEU HSS QE 696 A5212
Area: Eastern Beringia, Yukon - central
Topics: Glacial history - Yukon, Glacial geomorphology - moraines, Glacial dynamics

Edwards, M. E., and P. F. McDowell

1989 Quaternary Deposits at Birch Creek, Northeastern Interior Alaska: The Possibility of Climatic Reconstruction. In *Late Cenozoic History of the Interior Basins of Alaska and the Yukon*, edited by L. D. Carter, T. D. Hamilton and J. P. Galloway, pp. 48-50. Circular 1026. United States Geological Survey.

Location: AEU SCI QE 75 C57
Area: Eastern Beringia, Alaska - central
Topics: Stratigraphy, Pollen records, Plant macrofossils, Tephra - Old Crow, Palaeosols, Climate history - Alaska

Ferrians Jr., O. J.

1989 Glacial Lake Atna, Copper River Basin, Alaska. In *Late Cenozoic History of the Interior Basins of Alaska and the Yukon*, edited by L. D. Carter, T. D. Hamilton and J. P. Galloway, pp. 85-88. Circular 1026. United States Geological Survey.

Location: AEU SCI QE 75 C57
Area: Eastern Beringia, Alaska - southeastern
Topics: Glacial history - Alaska, Glacial lake sequences - Atna, Stratigraphy, Dating - analysis of radiocarbon dates

Fulton, R. J., M. M. Fenton, and N. W. Rutter
1986 Summary of Quaternary Stratigraphy and History, Western Canada. Quaternary Science Reviews 5:229-241.

Deposits of three Wisconsinan substages (Early, Middle and Late), Sangamonian Stage, Illinoian Stage and older Quaternary stratigraphic units are recognized in Western Canada. The age assignment of these units is based on radiocarbon dating, vertebrate paleontology, paleomagnetic data, and on dating and correlation of tephra.

Quaternary deposits older than Illinoian are probably present in most parts of Western Canada but only in southern Alberta and Saskatchewan is there definite stratigraphic evidence (vertebrate paleontology and paleomagnetic) which permits assigning ages to these units. Here, faunal assemblages with Aftonian, Kansan, and Yarmouthian affinities have been identified in both glacial and nonglacial deposits.

Glacial deposits referred to the Illinoian Stage are present in many parts of the area. The age of these is generally based on stratigraphic position: they underlie nonglacial deposits or a weathering horizon ascribed to the Sangamonian Stage. The most extensive glaciation of the southern Canadian Plains occurred during this stage and it probably was the first time that Laurentide ice reached the Cordillera.

Nonglacial materials of Sangamonian age have been identified in all parts of the area where intensive Quaternary stratigraphic work has been done. The age assignment of these units is in most places based on their warm climate affinities, stratigraphic position below Middle Wisconsinan nonglacial units, content of vertebrate fossils, and presence of organic material older than the limit of radiocarbon dating.

Early Wisconsinan glacial deposits occur in all areas where Sangamonian interglacial and Middle Wisconsinan nonglacial deposits have been recognized. In most other areas they are difficult to separate from older glacial deposits.

There is abundant evidence that the Middle Wisconsinan Substage was primarily a nonglacial period in Western Canada. Recognition of Middle Wisconsinan deposits is primarily based on the presence of organic material, 20-50 ka, dated by the radiocarbon method.

Evidence of cooler climates, heralding Late Wisconsinan glaciation, is locally present as early as 29 ka. The southern Canadian Plains were probably covered by Laurentide ice by 20 ka but the Cordilleran ice was still advancing in southern British Columbia 17.5 ka. The Late Wisconsinan Laurentide advance in the southern Plains was not as extensive as the Illinoian or Early Wisconsinan advances. The same appears true of the northern sector of the Cordilleran ice-sheet, but in the southern sector, the limits of Late Wisconsinan and earlier ice-sheets lie outside the area covered by this report. The Late Wisconsinan Cordilleran Ice-Sheet was retreating by 13 ka, and by 10 ka glacier cover was little more extensive than at present. The Laurentide Ice-Sheet was retreating before 13.5 ka, had probably receded onto the Shield by 11.5 ka, and had disappeared from Western Canada by 7.3 ka.

Notes: Special volume, *Quaternary Glaciations of the Northern Hemisphere*, edited by V. Sibrava, D. Q. Bowen, and G. M. Richmond. Report of IGCP Project 24.
Location: AEU SCI QE 696 Q245
Area: Eastern Beringia, Canada - western, Yukon
Topics: Review of glacial history - Canada - western

Gillen, K. P., and M. E. Evans
1989 New Geomagnetic Paleosecular-Variation Results from the Old Crow Basin, Yukon Territory, and their Use in Stratigraphic Correlation. Canadian Journal of Earth Sciences 26:2507-2511.

A total of 626 fully oriented samples were collected from two laterally equivalent vertical sections (each approximately 20 m thick) in Pleistocene sediments exposed in riverbank outcrops on the Old Crow River, Yukon Territory. The paleomagnetic records recovered reveal a sequence of three features correlatable with results obtained from previously sampled sections some 5 km upstream. This correlation, which is confirmed by magnetic-susceptibility measurements, allows the stratigraphic position of the Old Crow Tephra to be inferred, even though it does not actually occur at this locality; it also provides strong support for the reality of these paleosecular-variation signals. The most prominent of these take the form of repeating linear perturbations, which are here interpreted as evidence of stationary sources of reversely directed flux in the outer core. Such reverse-flux patches exist elsewhere in the modern field, but a simple magnetostatic model suggests that the paleosources were apparently an order of magnitude stronger.

Location: AEU SCI QE 1 C212
Area: Eastern Beringia, Yukon - northern
Topics: Tephra - Old Crow, Palaeomagnetism, Magnetic susceptibility

Hamilton, T. D.

1982 A Late Pleistocene Glacial Chronology for the Southern Brooks Range: Stratigraphic Record and Regional Significance. Geological Society of America Bulletin 93:700-716.

Radiocarbon dates from 11 measured sections in the Koyukuk region provide a chronology of the last Pleistocene glaciation. Glaciers were advancing strongly by 24,000 yr ago; they built moraines near the south flank of the Brooks Range, retreated briefly about 22,000 to 20,000 yr B.P., then readvanced at least one more time into their terminal zones. Glaciation was accompanied by alluviation of the Koyukuk and Kobuk drainage systems and by periglacial processes that resemble those taking place today farther north and at higher altitudes. Moraines near the south flank of the range were being revegetated by 13,500 yr B.P. A strong final readvance into end-moraine belts of some northern valleys occurred about 13,000 to 12,500 yr ago, and this event may be synchronous with less extensive glacier readvances in upper valleys of the Koyukuk region. Upper valleys were largely deglaciated by 11,800 yr B.P.

Dated stratigraphic sections from the northern Alaska Range show similar ages for initiation and close of glaciation and also suggest a possible interstadial episode about 20,000 yr ago. Scanty records of fluctuations during ice wastage probably reflect the general scarcity of datable wood, peat, and organic soils between about 19,500 and 13,500 yr ago. The Brooks Range and Alaska Range chronologies closely approximate glacial successions determined elsewhere in eastern Beringia and in Siberia. Advance and retreat of glaciers throughout this region evidently were associated with widespread climatic changes that also controlled the late Wisconsin history of the Laurentide ice sheet.

The Itkillik II and late Itkillik phases of former usage are part of a single glaciation that was entirely separate from the preceding Itkillik I ice advance. For this reason, the local term "Walker Lake Glaciation" is here extended to the last major glaciation of the entire southern Brooks Range, and use of the Itkillik phases should be discontinued. The term "Itkillik Glaciation" is hereby restricted to the next older ice advance, in accord with its original definition.

Cold and dry conditions during the last glaciation of eastern Beringia are indicated by (1) relatively small mountain glaciers, (2) slight (200-m) depression of glaciation limits below modern values, (3) periglacial features indicating severe frost action on slopes with little protective plant cover, (4) widespread accretion of eolian sand, (5) low pollen influx rates, (6) scarcity of radiocarbon-datable organic remains, and (7) general absence of carbonaceous paleosols. Plant growth may have been much more restricted than generally believed, with relatively low capacity to support grazing animals and human hunting bands.

Location: AEU SCI QE 1 G341
Area: Eastern Beringia, Alaska - northern
Topics: Dating - analysis of radiocarbon dates, Glacial history - Alaska, Periglacial features, Stratigraphy, Glacial geomorphology, Palaeosols, Loess, Pollen records, Plant macrofossils - wood, Plant macrofossils - peat, Plant macrofossils - *Salix*

1986 Correlation of Quaternary Glacial Deposits in Alaska. Quaternary Science Reviews 5:171-180.

Notes: Special volume, *Quaternary Glaciations of the Northern Hemisphere*, edited by V. Sibrava, D. Q. Bowen, and G. M. Richmond. Report of IGCP Project 24.
Location: AEU SCI QE 696 Q245
Area: Eastern Beringia, Alaska
Topics: Review of glacial history - Alaska

1989 Upper Cenozoic Deposits, Kanuti Flats and Upper Kobuk Trench, Northern Alaska. In *Late Cenozoic History of the Interior Basins of Alaska and the Yukon*, edited by L. D. Carter, T. D. Hamilton and J. P. Galloway, pp. 45-47. Circular 1026. United States Geological Survey.

Location: AEU SCI QE 75 C57
Area: Eastern Beringia, Alaska - central

Topics: Glacial geomorphology, Glacial history - Alaska

Hamilton, T. D., G. M. Ashley, K. M. Reed, and D. P. Van Etten

1984 Stratigraphy and Sedimentology of Epiguruk Bluff - A Preliminary Account. In *The United States Geological Survey in Alaska: Accomplishments During 1982*, edited by K. M. Reed and S. Bartsch-Winkler, pp. 12-15. Circular 939. United States Geological Survey.

Location: AEU SCI QE 75 C57

Area: Eastern Beringia, Alaska - northwestern

Topics: Stratigraphy, Palaeosols, Loess, Periglacial features, Plant macrofossils, Faunal remains - *Mammuthus primigenius*, Faunal remains - *Mammuthus*, Faunal remains - *Equus lambei*, Faunal remains - *Lemmus sibiricus*, Faunal remains - *Spermophilus parryii*, Faunal remains - *Dicrostonyx*, Faunal remains - *Microtus*, Molluscs

Hamilton, T. D., and J. Brigham-Grette

1991 The Last Interglaciation in Alaska: Stratigraphy and Paleoecology of Potential Sites. Quaternary International 10-12:49-71.

At least 20 localities in Alaska contain deposits that may provide information on the last interglaciation (Oxygen-Isotope Substage 5e). These widely dispersed localities include river bluffs, coastal bluffs and terraces, elevated marine shorelines, lake basins, and artificial excavations. Most of the inferred interglacial deposits contain macrofossils or pollen that are older than the range of radiocarbon dating and commonly indicate climate as warm as or warmer than the present. At a few localities, evidence for deep thaw of permafrost also indicates a warm paleoclimate.

At eight localities, the Old Crow tephra occurs at or below organic deposits that may represent Substage 5e. The tephra occurs beneath conspicuous organic deposits at Fairbanks, the Yukon Palisades, and Holitna lowland, and directly above a peat bed at Hogatza Mine. At Birch Creek, Halfway House, Ky-ll, and Imuruk Lake, the tephra occurs within a paleosol or organic deposit, but other organic horizons that more likely indicate interglacial conditions occur at higher stratigraphic levels. The varied stratigraphic relations of the Old Crow tephra suggest that it may have been deposited close to the boundary between Isotope Substages 6 and 5, which is dated at about 130 ka in the marine record and between 132 and 140 ka on land. These age relations suggest that the tephra may have been deposited about 135 $\pm$ 5 ka, validating the recent fission-track age determination of 140 $\pm$ 10 ka for this deposit.

Six coastal localities contain deposits of probable interglacial age, and these commonly are associated with evidence for eustatic sea levels higher than those of the present. Beach and sublittoral sediments of the Pelukian transgression occur up to 12 m asl along the northwest coast of Alaska, and are correlative with barrier island and lagoonal sediments on the Alaskan Arctic Coastal Plain. Both sets of deposits commonly contain extralimital mollusks and microfauna that indicate marine water slightly warmer than present and suggest that seasonal sea ice did not extend south of Bering Strait during the last interglacial as it does today. Farther south, elevated marine-terrace deposits on Amchitka Island contain marine invertebrates that indicate a climate warmer than at present. Peat horizons in coastal exposure at Goose Bay and coastal terraces at Lituya Bay contain pollen spectra that suggest forests like those of the present day, and spruce macrofossils exposed on Baldwin Peninsula indicate boreal forest more extensive than at present.

Sediments from several lakes in northwestern Alaska may contain continuous records of the last interglaciation. A major warm interval, possibly Isotope Substage 5e, has been identified in a core from Squirrel Lake by a peak in *Picea* pollen that indicates forest extension beyond present limits. Similar pollen records are potentially available from two maars which formed in the Cape Espenberg area more than 125 ka.

Terrestrial organic deposits thought to record the last interglaciation occur interstratified with marine and glaciogenic sediments in the Nushagak Lowland of southwest Alaska and on Baldwin Peninsula in Kotzebue Sound. Extensive exposures along the Copper and Nenana Rivers may also contain organic deposits that record the last interglaciation.

Location: AEU SCI QE 696 Q229

Area: Eastern Beringia, Alaska

Topics: Sea level changes, Molluscs, Stratigraphy, Review of pollen records - Alaska, Review of glacial history - Alaska, Plant macrofossils - peat, Plant macrofossils - wood, Loess, Tephra - Old Crow

Hamilton, T. D., J. P. Galloway, and E. A. Koster

1988 Late Wisconsin Eolian Activity and Related Alluviation, Central Kobuk River Valley. In *Geologic Studies in Alaska by the U.S. Geological Survey During 1987*, edited by J. P. Galloway and T. D. Hamilton, pp. 39-43. Circular 1016. United States Geological Survey.

Location: AEU SCI QE 75 C57
Area: Eastern Beringia, Alaska - northwestern
Topics: Aeolian deposits, Dating - analysis of radiocarbon dates, Stratigraphy, Glacial history - Alaska, Geomorphology - dunes, Palaeosols, Plant macrofossils - peat

Hamilton, T. D., G. A. Lancaster, and D. A. Trimble

1987 Glacial Advance of Late Wisconsin (Itkillik II) Age in the Upper Noatak River Valley - A Radiocarbon-Dated Stratigraphic Record. In *Geologic Studies in Alaska by the U.S. Geological Survey During 1986*, edited by T. D. Hamilton and J. P. Galloway, pp. 35-39. Circular 998. United States Geological Survey.

Location: AEU SCI QE 75 C57
Area: Eastern Beringia, Alaska - northern
Topics: Dating - analysis of radiocarbon dates, Glacial history - Alaska, Stratigraphy, Glacial geomorphology, Plant macrofossils - peat, Plant macrofossils - wood

Hamilton, T. D., and S. C. Porter

1975 Itkillik Glaciation in the Brooks Range, Northern Alaska. Quaternary Research 5:471-497.

During the Itkillik Glaciation the Brooks Range supported an extensive mountain-glacier complex that extended for 750 km between 141° and 158°W longitude. Individual ice streams and piedmont lobes flowed as much as 50 km beyond the north and south margins of the range. Glaciers in the southern Brooks Range were longer than those farther north because of a southerly precipitation source, whereas those in the central and eastern part of the range were larger than glaciers at the extremities of the mountain system because of higher and more-extensive accumulation areas. Glacier equilibrium-line altitudes (ELAs) at the time of greatest advance were depressed 600 $\pm$ 100 m below present levels, whereas during a less-extensive late-glacial readvance (Alapah Mountain) ELA depression was about 300 $\pm$ 30 m. Radiocarbon dates indicate that Itkillik drift correlates with Late Wisconsin drift along the southern margin of the Laurentide Ice Sheet and with drift of Cordilleran glaciers in southern Alaska and the western conterminous United States deposited during the last glaciation. Itkillik I moraines represent the maximum ice advance under cold full-glacial conditions between about 24,000 and 17,000 ^{14}C y. a. Itkillik II sediments, probably deposited close to 14,000 y. a., are characterized by abundant outwash and ice-contact stratified drift implying a milder climate than that of the Itkillik I phase. Alapah Mountain moraines at the heads of valleys draining high-altitude ($\geq$ 1800 m) source areas record a possible late Itkillik readvance that is not yet closely dated. Itkillik glaciers may have largely disappeared from Brooks Range valleys by the beginning of the Holocene.

Location: AEU SCI QE 696 Q24
Area: Eastern Beringia, Alaska - northern
Topics: Dating - analysis of radiocarbon dates, Glacial history - Alaska, Plant macrofossils - wood, Stratigraphy, Pollen records - Alaska, Glacial geomorphology - moraines

Hamilton, T. D., and R. M. Thorson

1983 The Cordilleran Ice Sheet in Alaska. In *Late-Quaternary Environments of the United States Volume 1 The Late Pleistocene*, edited by S. C. Porter, pp. 38-52. University of Minnesota Press, Minneapolis, Minnesota.

Notes: H. E. Wright Jr. (series ed.).
Location: AEU SCI QE 696 L35
Area: Eastern Beringia, Alaska

Topics: Dating - analysis of radiocarbon dates, Review of glacial history - Alaska, Stratigraphy, Glacial dynamics

Harry, D. G., H. M. French, and W. H. Pollard

1988 Massive Ground Ice and Ice-Cored Terrain near Sabine Point, Yukon Coastal Plain. Canadian Journal of Earth Sciences 25:1846-1856.

Massive ground ice, 5-6 m in thickness, is exposed within retrogressive thaw flow slides near Sabine Point, Yukon Territory. The ice is present near the upper surface of Buckland Till and is overlain and thaw truncated by mudflow sediments and a thick unit of peat and organic silt. Cryotextural and petrographic analyses suggest that the ice formed primarily by segregation processes. The ice occurs within an area of rolling terrain, surrounded by lacustrine basins. This may form a remnant of an initial post-Buckland surface, degraded by multiple cycles of thermokarst during the period 14 000 to 8000 years BP.

Location: AEU SCI QE 1 C212
Area: Eastern Beringia, Yukon - northern
Topics: Dating - analysis of radiocarbon dates, Stratigraphy, Glacial history - Yukon, Plant macrofossils - wood, Plant macrofossils - peat, Periglacial features - thermokarst, Permafrost - ground ice

Hedlin, M. A. H.

1986 *A Pleistocene High-Latitude Geomagnetic Study*. Unpublished M.Sc. dissertation. Department of Physics, University of Alberta, Edmonton, Alberta. xiv + 160 pages.

This thesis reports paleomagnetic results from four vertical sequences of samples of Pleistocene sediments at 68° N latitude in the Yukon territory. Each sequence is believed to cover some, or all, of the time between 80,000 and 140,000 years B.P. The initial goal was to study the long-term changes in the geomagnetic field, but a feature of particular interest was the so-called Blake Event which is believed by many to have been a time of global reversed polarity that occurred about 100,000 years ago.

No reversed interval is recorded in these sediments, most likely because of a hiatus, but twice in each sedimentary sequence linear perturbations of the geomagnetic field are recorded. These perturbations involve outward trajectories with 22° movement to a westerly declination and shallow inclination and superimposed return trajectories. The reality of these perturbations is supported by the fact that they are recorded with similar character in each sequence and by a time series analysis which reveals a strong power peak, with a high degree of polarization, at the wavelength corresponding to the perturbations.

Analyses of two aspects of the data sets: the far-sidedness of the mean virtual geomagnetic pole (VGP) and the angular dispersion of the VGPs about this mean, as well as consideration of likely sedimentation rates lead to the conclusion that the span of time covered by the samples is not sufficient to average out the effect of dipole wobble. It is concluded that the perturbations were due to fluctuations in the non-dipole field caused by an intermittent eddy located beneath a stationary bump, or inhomogeneity, at the core-mantle boundary. It is believed that this eddy led to a radially orientated magnetic dipole that posessed [sic] a time varying amplitude. Elementary magnetostatic theory shows that such a radial dipole with a magnetic moment as low as 8% that of the Earth's main dipole could cause the perturbations observed in this study. Furthermore, stationary radial dipoles with outwardly directed magnetic flux could cause the far-sidedness of average VGPs that has been observed in sequences of paleomagnetic observations made over the last 20 years.

The effect of cryoturbation on the natural remanent magnetization preserved in poorly consolidated sediments was investigated. It is concluded that in some cases cryoturbation may allow the resetting of magnetization at a time significantly later than the time of deposition by providing the interstitial water necessary to allow the magnetic particles to re-orientate themselves.

Location: AEU SP COLL 86F-87
Area: Eastern Beringia, Yukon - northern
Topics: Palaeomagnetism

Hoffecker, J. F.

1988 Applied Geomorphology and Archaeological Survey Strategy for Sites of Pleistocene Age: An Example from Central Alaska. Journal of Archaeological Science 15:683-713.

The development of a survey strategy for archaeological sites of Pleistocene age through the application of historical geomorphology is described. Geomorphic contexts in the northern foothills of the Alaska Range with potential for producing archaeological remains from the 30,000-12,000 bp interval were identified and subjected to exploratory testing. Contexts were selected on the basis of estimated age, palaeotopographic setting and geomorphic history, and included glaciofluvial outwash, side-valley fan alluvium, loessic colluvium and primary frozen loess. Testing was eventually focused on formerly deflated terrace surfaces — a potential source area for artifacts redeposited in the outwash or alluvium. Although the results of the exploratory testing were negative, and archaeological sites in the region remain confined to loess deposits of the later Late Glacial (12,000-10,000 bp), discoveries in other parts of Beringia suggest that sites of earlier Late Glacial age (14,000-12,000 bp) are also likely to be present in the foothills. The application of historical geomorphology in surveys for early prehistoric sites is essential for effective use of available resources and for maximizing the significance of the results (positive or negative).

Location: AEU PMC CC 1 J86
Area: Eastern Beringia, Alaska - central
Topics: Archaeological sites - search methodology, Geoarchaeology, Geomorphology, Glacial geomorphology, Review of glacial history - Alaska, Stratigraphy

Hopkins, D. M.

1959 History of Imuruk Lake, Seward Peninsula, Alaska. Geological Society of America Bulletin 70:1033-1046.

A study of Imuruk Lake, a large, shallow lake in north-central Seward Peninsula, Alaska, illuminates the climatic history of northwestern Alaska and the tectonic history of central Seward Peninsula during Pleistocene and Recent time. Special interest attaches to the older lake sediments, because they contain evidence concerning the climate, fauna, and flora that existed in the vicinity of Bering Strait at a time when the Bering land bridge was open and when animal and plant populations were being exchanged between the eastern and western hemispheres.

The lake is 8 miles long and less than 10 feet deep; bottom sediments consisting of reworked wind-blown silt bury a rolling bedrock topography of much greater relief. Analysis of the hydrologic regime indicates that much of the water draining into the lake is lost by evaporation; smaller quantities are lost by discharge through the outlet, the Kugruk River, and by leakage into the lava flows along the lake shore. Changes in the duration and temperature of the summer ice-free season would result in changes in the amount of water lost by evaporation and thus in appreciable changes in lake level.

Imuruk Lake occupies an initial low area on basaltic lava flows of Quaternary age, but the initial low area has been modified by faulting and now lies in a poorly defined graben. Topographic evidence confirmed by a study of lacustrine terraces indicates that until recently Imuruk Lake drained westward into the Noxapaga River instead of eastward into the Kugruk River. A history of repeated warping of the lake basin, on which is superimposed a history of oscillating lake level which is due to changes in climate, is recorded by three systems of abandoned shore-line features found along the shores: a warped shore cliff of probable Illinoian age, a double set of warped terraces of probable Wisconsin age, and a low, horizontal terrace of Recent age. Bones of bison, horse, and mammoth were found in peaty sediments containing many twigs but no large wood; their presence indicates that these mammals, at least, were capable of surviving in a tundra environment during cold stages of the Pleistocene epoch and at a time when the Bering land bridge was in existence nearby.

The sediments filling the deeper parts of the bedrock basin of Imuruk Lake probably contain an uninterrupted pollen record that reflects vegetation changes in central Seward Peninsula beginning in middle Illinoian time and terminating a few thousand years ago. Core drilling and pollen analysis of these sediments would greatly amplify our understanding of late Pleistocene events in the vicinity of the Bering land bridge.

Location: AEU SCI QE 1 G341
Area: Eastern Beringia, Alaska - western
Topics: Stratigraphy, Plant macrofossils - peat, Glacial history - Alaska, Faunal remains - *Mammuthus*, Faunal remains - *Bison*, Faunal remains - *Equus*, Geomorphology, Tephra - Alaska, Tectonism

1967 Quaternary Marine Transgressions in Alaska. In *The Bering Land Bridge*, edited by D. M. Hopkins, pp. 47-90. Stanford University Press, Stanford, California.

At least nine intervals during which sea level stood high enough to flood Bering Strait are recorded in western Alaska by deposits ranging in age from late Pliocene to Recent. They can be divided into seven age classes — named here "marine transgressions" (Table 1) — on the basis of stratigraphic relationships, distinctive molluscan faunas, position in the geomagnetic polarity-reversal sequence, and radiometric dating. They can be correlated with a similar but less complete Quaternary marine sequence in Siberia.

The Beringian transgression spanned late Pliocene time and part of Pleistocene time. Most Beringian deposits are probably older than the first continental glaciation, but Beringian deposits on St. George Island may be younger than the first widespread glaciation in Iceland ... The Anvilian deposits are younger than a major glaciation at Nome, but they cannot be related to the glacial-interglacial events recognized in the conterminous United States and Europe. The Einahnuhtan transgression probably corresponds to the interglaciation immediately preceding the Mindel Glaciation in the Alps, and the Kotzebuan to the Mindel-Riss Interglaciation in the Alps and the interglaciation immediately preceding the Illinoian Glaciation in the United States. The early part of the Pelukian transgression corresponds to the Riss-Würm Interglaciation of the Alps and the Sangamon Interglaciation of the United States; the later part may possibly correspond to the Broerup Interstade of northern Europe. The Woronzofian transgression took place during a middle Wisconsin interstade, and the Krusensternian transgression records the postglacial rise in sea level.

The Pliocene and Pleistocene Beringian transgression and the late Pleistocene Pelukian transgression are complex; each includes at least two episodes of high sea level separated by marine regressions of substantial duration. Sea level probably reached its highest position in late Cenozoic time during the middle Pleistocene Anvilian transgression. Sea level during the late Pleistocene Woronzofian transgression was probably lower than present sea level, but high enough to bring Bering Strait into existence during part of the interval between 25,000 and 35,000 years ago.

Water temperatures were considerably warmer than at present in most places during the Beringian transgression, and were slightly warmer than at present during the Anvilian, Kotzebuan, and Pelukian transgressions. The Woronzofian transgression was a time of cold seas; the foraminifera and ostracodes of the Woronzofian beds indicate that water temperatures were lower than those of the present time. Transarctic migrations are indicated by first appearance and unique appearances of Atlantic mollusks in Alaska during several transgressions, suggesting that conditions in the Arctic Ocean were more favorable for molluscan life during Pleistocene interglaciations than at present.

Notes: Based on a Symposium held at the VII Congress of the International Association for Quaternary Research (INQUA), Boulder, Colorado, 1965. Summary used as abstract.
Location: AEU SCI QE 39 H79
Area: Eastern Beringia, Alaska - western, Alaska - southern, Pribilof Islands, Aleutian Islands
Topics: Plant macrofossils - wood, Sea surface temperature, Dating - uranium series, Tephra - Alaska, Tectonism, Periglacial features - fossil ice wedges, Sea level changes, Stratigraphy, Molluscs - marine, Foraminifera, Ostracodes, Pollen records - Alaska, Glacial history - Alaska, Beringian land bridge connection

Hughes, O. L.

1969 Pleistocene Stratigraphy, Porcupine and Old Crow Rivers, Yukon Territory. Geological Survey of Canada Paper 69-1 Part A:209-212. Geological Survey of Canada, Ottawa, Ontario.

Location: AEU SCI QE 185 C2
Area: Eastern Beringia, Yukon - northern
Topics: Stratigraphy, Glacial history - Yukon

1970 Quaternary Geology, Yukon Territory and Western District of Mackenzie. In *Early Man and Environments in Northwest North America*, edited by R. A. Smith and J. W. Smith, pp. 9-11. University of Calgary Archaeological Association, Calgary, Alberta.

Location: AEU HSS E 77.8 E12
Area: Eastern Beringia, Yukon, Northwest Territories - western
Topics: Glacial history - Yukon, Glacial history - Northwest Territories

1972 *Surficial Geology of Northern Yukon Territory and Northwestern District of Mackenzie, Northwest Territories*. Geological Survey of Canada Paper 69-36. Geological Survey of Canada, Ottawa, Ontario. 11 pp.

For discussion of Quaternary geology, the map-area may be considered in three parts: 1) a large area of plain and plateau north of Mackenzie Mountains and east of Richardson Mountains, including also Yukon Coastal Plain, that was overridden by Laurentide ice; 2) the southern part of the map-area, embracing parts of Mackenzie, Wernecke, and Ogilvie Mountains, which experienced repeated advances of valley glaciers; 3) the remaining unglaciated area.

Three advances of valley glaciers are inferred, mainly from geomorphic evidence. Laurentide ice advanced into the area at least twice. Radiocarbon dating indicates that the last advances of both mountain glaciers and Laurentide ice culminated in late Wisconsin time. The preceding advances are presumed to be of pre-Classical Wisconsin or pre-Wisconsin age.

Thick Pleistocene sediments exposed in Bell, Bluefish and Old Crow basins, all in the unglaciated area, include two glaciolacustrine beds intercalated between nonglacial sediments. The glaciolacustrine beds are judged to correlate with the two known advances of Laurentide ice, when drainage, together with turbid meltwater, was diverted into the headwaters of Porcupine River.

Notes: Accompanies Map 1319A "Surficial Map of Northern Yukon Territory and Northwest District of Mackenzie, Northwest Territories" (in pocket).
Location: AEU SCI QE 185 C2
Area: Eastern Beringia, Yukon - northern, Northwest Territories - western
Topics: Dating - analysis of radiocarbon dates, Glacial geomorphology, Glacial history - Yukon, Glacial history - Northwest Territories, Stratigraphy, Plant macrofossils - peat

1989 Quaternary Chronology, Yukon and Western District of Mackenzie. In *Late Cenozoic History of the Interior Basins of Alaska and the Yukon*, edited by L. D. Carter, T. D. Hamilton and J. P. Galloway, pp. 25-29. Circular 1026. United States Geological Survey.

Location: AEU SCI QE 75 C57
Area: Eastern Beringia, Yukon, Northwest Territories - western
Topics: Tephra - Sheep Creek, Glacial history - Yukon, Glacial history - Northwest Territories

Jackson Jr., L. E.

1989 Paleoglaciology of the Selwyn Lobe of the Cordilleran Ice Sheet and Quaternary Stratigraphy of the East-Central Yukon. In *Late Cenozoic History of the Interior Basins of Alaska and the Yukon*, edited by L. D. Carter, T. D. Hamilton and J. P. Galloway, pp. 60-65. Circular 1026. United States Geological Survey.

Location: AEU SCI QE 75 C57
Area: Eastern Beringia, Yukon - southern
Topics: Glacial history - Yukon, Stratigraphy, Glacial dynamics, Faunal remains - *Bison*, Faunal remains - *Mammuthus primigenius*

Jackson Jr., L. E., B. Ward, A. Duk-Rodkin, and O. L. Hughes

1991 The Last Cordilleran Ice Sheet in Southern Yukon Territory. Géographie physique et Quaternaire 45:341-354.

The Cordilleran Ice Sheet in Yukon radiated from ice-divides in the Selwyn, Pelly, Cassiar, and eastern Coast Mountains and was contiguous with a piedmond [sic] glacier complex from the St. Elias Mountains. Expansion of glaciers in divide areas could have been underway by 29 ka BP but these did not merge to form the ice sheet until after 24 ka BP. The firn line fell to approximately 1500 m at the climax of McConnell Glaciation. Flow within the ice sheet was more analogous to a complex of merged valley glaciers than to that of extant ice sheets: topographic relief was typically equal to or exceeded ice thickness, and strongly influenced ice flow. Surface gradients on the ice sheet were fractions of a

degree. Steeper ice-surface gradients occurred locally along the digitate ice margin. Retreat from the terminal moraine was initially gradual as indicated by recessional moraines within a few tens of kilometres of the terminal moraine. Small magnitude readvances occurred locally. The ice sheet eventually disappeared through regional stagnation and downwasting in response to a rise in the firn line to above the surface of the ice sheet. Regional deglaciation was complete prior to approximately 10 ka BP.

Location: AEU SCI G 1 R452
Area: Eastern Beringia, Yukon - southern
Topics: Glacial history - Yukon, Climate history - Yukon, Stratigraphy, Glacial dynamics, Glacial geomorphology, Glacial lake sequences

Johnson, P. G., and R. J. Kodybka

1984 Problems of Quaternary Glacial Correlation Due to Regional Ice/Local Ice Interactions, Ruby Range, Southwest Yukon. In *Correlation of Quaternary Chronologies*, edited by W. C. Mahaney, pp. 411-422. Geo Books, Norwich, England.

In the southwest Yukon currently glacierized regions are very close to unglaciated areas. The Ruby Range, within the transition area, is a zone which was influenced by converging regional ice in the early to mid Pleistocene and by local ice in the late Pleistocene. The major problems to the interpretation of the Quaternary are the glaciological conditions which must have occurred and the difficulties of dating all the glacial events identified in the field.

Location: AEU SCI QE 696 C82
Area: Eastern Beringia, Yukon - southwestern
Topics: Glacial history - Yukon, Geomorphology, Glacial dynamics

Jopling, A. V., W. N. Irving, and B. F. Beebe

1981 Stratigraphic, Sedimentological and Faunal Evidence for the Occurrence of Pre-Sangamonian Artefacts in Northern Yukon. Arctic 34:3-33.

The stratigraphic position of artefacts of undoubted Pleistocene age found in the Old Crow Basin has long been in question. We report on geological, palaeontological and archaeological excavations and studies there which show that artefacts made by humans occur in deposits of Glacial Lake Old Crow laid down before Sangamonian time, probably during a phase of the Illinoian (≡Riss) glaciation. The geological events surrounding and following the deposition of Glacial Lake Old Crow were complicated by a changing lake level, localized soft-sediment flowage, pingo formation and dissolution, and by the colluvial transport of vertebrate fossils and artefacts. Following deepwater stages of the Lake, an environment not greatly different from that of the present is suggested by the excavated vertebrate fauna and by permafrost features, although warming during the succeeding Sangamon can be considered likely. Sangamonian and later phenomena in the Old Crow Basin are referred to briefly; they show that humans persisted in the area for some time.

Location: AEU SCI G 600 A67
Area: Yukon - northern
Topics: Geoarchaeology, Palaeontological sites - Old Crow, Bone modification, Review of archaeological studies - Old Crow, Palaeochannels, Glacial lake sequences - Old Crow, Stratigraphy, Palaeontological sites - Old Crow, Plant macrofossils, Periglacial features, Faunal remains - Yukon, Dating, Tephra - Yukon, Pollen records - Yukon, Taphonomy, Faunal remains - fish, Palaeosols

Kaufman, D. S., D. M. Hopkins, and P. E. Calkin

1988 Glacial Geologic History of the Salmon Lake Area, Seward Peninsula. In *Geologic Studies in Alaska by the U.S. Geological Survey During 1987*, pp. 91-94. Circular 1016. United States Geological Survey.

Location: AEU SCI QE 75 C57
Area: Eastern Beringia, Alaska - western

Topics: Glacial history - Alaska, Glacial geomorphology, Stratigraphy, Plant macrofossils - peat, Tephra - Aniakchuk

Lea, P. D., and C. F. Waythomas

1986 Late-Pleistocene Coversands in Southwestern Alaska. In *AMQUA, 9th Biennial Meeting, Champaign, Illinois, Program and Abstracts*, p. 93.

Location: AEU HSS QE 696 A5212
Area: Eastern Beringia, Alaska - southwestern
Topics: Tephra - Alaska, Aeolian deposits

1990 Late-Pleistocene Eolian Sand Sheets in Alaska. Quaternary Research 34:269-281.

Nonglaciated lowlands in central and southwestern Alaska contain extensive deposits of upper-Quaternary eolian sand, derived largely from major outwash rivers. Although surface dunes are common, deep exposures consistently reveal that subhorizontally stratified sand and silt deposits dominate over dune cross strata. We hypothesize that (1) many of the subhorizontally stratified deposits represent full-glacial eolian sand sheets, formed when sand supply was limited by seasonally variable combinations of ice cementation, snow cover, high groundwater tables, and vegetation, and (2) many surface dunes reflect late-glacial and postglacial reworking under conditions of increased short-term availability of loose sand. The morphology of some surface dunes may therefore reflect mainly the intensity of reworking since the last glacial maximum, rather than full-glacial paleowind vectors or the age of the bulk of the underlying deposits.

Location: AEU SCI QE 696 Q24
Area: Eastern Beringia, Alaska
Topics: Aeolian deposits, Sedimentology - dunes, Dating - analysis of radiocarbon dates, Stratigraphy, Palaeowinds

Mackay, J. R., and S. R. Dallimore

1992 Massive Ice of the Tuktoyaktuk Area, Western Arctic Coast, Canada. Canadian Journal of Earth Sciences 29:1235-1249.

The extensive coastal exposure of massive underground ice at Peninsula Point, southwest of Tuktoyaktuk, Northwest Territories, is believed to be intrasedimental ice. The ice grew beneath a frozen diamicton during the downward aggradation of permafrost. The water source was probably glacier meltwater, with low negative $\delta^{18}O$ values, that flowed, under a substantial pressure, through permeable unfrozen sands. Evidence for a high water pressure is shown by ice dikes, which extend upward from the massive ice into the superincumbent diamicton. The diamicton was frozen when the dike water was injected, as proven by the chill contacts and petrofabrics. The diamicton - massive ice contact is a conformable contact with features characteristic of downward freezing. The continuity of $\delta^{18}O$ and δD profiles from the top of the massive ice downward to a depth of 10 m into the underlying frozen sand demonstrates a common water source for the massive ice and interstitial ice in the underlying sand. A similar continuity of $\delta^{18}O$ profiles has been determined from three drill holes at another site 15 km northeast of Tuktoyaktuk, Northwest Territories. The ages of both the diamicton and massive ice at the Peninsula Point site are uncertain, because of unexplained differences in published radiocarbon dates.

Location: AEU SCI QE 1 C212
Area: Eastern Beringia, Northwest Territories - northwestern
Topics: Permafrost - ground ice, Stratigraphy, Plant macrofossils - peat, Stable isotopes - $\delta^{18}O$, Hydrochemistry

MacNeish, R. S.

1962 A Discussion of the Recent Geology and Archaeological Sites in the Northern and Southern Yukon. In *Problems of the Pleistocene and Arctic*, pp. 40-43. Publications of McGill University Museums, Volume 2, Number 2. Montreal, Québec.

Notes: Compiled by G. R. Lowther

Location: AEU SCI QE 741 P72
Area: Eastern Beringia, Yukon
Topics: Glacial history - Yukon, Sea level changes, Pollen records - Yukon, Archaeological sites - Yukon, Climate history - Yukon, Geoarchaeology

Mathews, W. H.

1963 ***Quaternary Stratigraphy and Geomorphology of the Fort St. John Area Northeastern British Columbia.*** **Department of Mines and Petroleum Resources, Victoria, British Columbia. 22 pp.**

Unconsolidated sediments in the Fort St. John area include a twice repeated succession of gravel overlain by sand, silt, and clay, and each of these in turn by a till of eastern origin. Both successions are interpreted as: (1) gravel laid down by Peace River during or at the close of interglacial (and preglacial ?) intervals, (2) fine sediments laid down in lakes ponded in Peace River valley by ice advancing from the east, and (3) till laid down after ice reached the Fort St. John area. The younger till [early Wisconsin (?)] is covered by sediments, chiefly clay, from a series of proglacial lakes, and by local postglacial deposits.

The topography of the uplands reflects the form of the stream-eroded Cretaceous bedrock, modified slightly by glacial erosion and by the deposition of a thin mantle of till. Landform at intermediate levels is determined largely by sediments which were deposited in proglacial lakes both preceding and following the last glaciation from the east. Since the draining of the last proglacial lake Peace River has cut a trench 700 feet deep below the lake floor and 150 to 250 feet below its interglacial channel.

Ice from the Cordilleran area reached to within 15 miles of Fort St. John, overriding areas from which the early Wisconsin (?) eastern ice had already withdrawn.

The Quaternary history here is important in localizing the few available aquifers for shallow farm wells, and may have significantly influenced migration of early man into central North America.

Location: AEU SCI QE 697 M429
Area: British Columbia - northeastern
Topics: Stratigraphy, Glacial history, Glacial lake sequences - Glacial Lake Peace, Ice-free corridor, Human migration, Glacial geomorphology, Palaeochannels, Applied geology

Matthews Jr., J. V.

1980 **Possible Evidence of an Early Wisconsinan Warm Interstadial in East Beringia. In *AMQUA, 6th Biennial Meeting, Orono, Maine, Abstracts and Program*, pp. 130-131.**

Location: AEU HSS QE 696 A5212
Area: Eastern Beringia, Yukon - northern
Topics: Palaeontological sites - Old Crow, Stratigraphy, Tephra - Old Crow, Periglacial features, Pollen records, Climate history, Glacial lake sequences

McDowell, P. F., and M. E. Edwards

1984 **Loess Stratigraphy and Landscape Development, Yukon Flats Area, Interior Alaska. In *AMQUA, 8th Biennial Meeting, Boulder, Colorado, Program and Abstracts*, p. 80.**

Area: Eastern Beringia, Alaska - central
Topics: Loess, Stratigraphy, Tephra - Old Crow, Pollen records - Alaska, Palaeosols

Miller, M. M.

1976 **Quaternary Erosional and Stratigraphic Sequences in the Alaska - Canada Boundary Range. In *Quaternary Stratigraphy of North America*, edited by W. C. Mahaney, pp. 463-492. Dowden, Hutchinson & Ross, Inc., Stroudsburg, Pennsylvania.**

Field studies in the Boundary Range provide a Quaternary history of the northern Cordilleran Ice Sheet. In the Alaskan coastal sector, dense forest cover and mass-wastage have rendered interpretations difficult, but stratigraphic evidence has been obtained from sites exposed by debris avalanches and construction work. An erosional chronology is established from cirque distributions, revealing a seven-fold pattern with a vertical spacing of 220 m. A sequence of glacial berms in trunk valleys is also correlated. Observations in the Alaska Panhandle are discussed from upper Lynn Canal to Taku Inlet and eastward to the border, with comparisons drawn from the less afforested Canadian sector between Tulsequah, B.C. and the northern end of Atlin Lake in the Yukon.

A number of Pleistocene glacial stages are identified, but the relationship is made complex by multiple provenances of ice. Two widespread occurrences of middle and late Wisconsinan till are noted, with evidence of a more extensive drift sheet from the early Wisconsinan. The only indications of pre-Wisconsinan glaciation is given by the presence of truncated high-level ice-scour features. Although the early Wisconsinan glaciation left erratics and well-weathered till sheets on upland surfaces above later glaciation limits, much of this evidence has been destroyed by the intensity of subsequent glacio-climatic events. The youngest tills are most commonly found in the lower valleys and fjord areas of the coast and in the basal sectors of broad valleys inland from the Atlin region. On the coast the uppermost till member is an indurated blue-gray boulder clay diamicton with course [sic] rounded clastics, situated at the top of the Gastineau Channel Formation. In places this unit is of marine origin, containing late Wisconsinan *Clinocardium* sp. shells. It rests on an older till with zones of mixed colluvium and glacio-fluvial facies. In the Panhandle, the lower till member has a mild weathering profile and is more compact and unsorted than the overlying unit. It too is a diamicton with included Leda-type shells. At higher levels it correlates with a weathered silty facies containing a few large boulders stratigraphically below but topographically above stained deltaic gravels of Holocene age at the mount of distributary streams from the Coast Range icefields. Above the boulder silt, to elevations of 160 m, is a marine clay containing shells of *Clinocardium*, *Pectin* and *Macoma* calcarea gemlin [sic] species, many of which have been disrupted and broken by subaqueous flow. An apparent correlate of this drift is the surface till in a terrestrial sequence on the hum [sic] of interior valleys. The weathering reflects regional intraglacial conditions, designated as the Post-Atlin II Intraglacial in the interior and Post-Gastineau-Sloko stage on the coast.

Counterparts of the sequence have been found in the Alexander Archipelago as well as in the inland Taku-Tusequah and Boulder Creek-McKee Creek-Atlin sectors. In the latter a Pine Creek Intraglacial and a Boulder Creek Intraglacial have been extrapulated [sic] at some 20,000 and 21,000 years BP, based on weathering and C^{14} evidence. Radiocarbon dates on the lowest till found in a sequence of three distinctive tills near Atlin reveal that a warmer wetter condition persisted in the interior prior to 40,000 years BP. A genetic relationship of the lowest till to oxidized high-level ground moraines near timberline is suggested and further related to paleosol horizons on higher nunataks of the Boundary Range. The youngest till member along the coast also appears to correlate with a two-fold late-Pleistocene moraine and kame terrace complex in the Fourth of July Creek Valley northeast of Atlin. High elevation lacustrine terraces on the shores of Tagish, Atlin and Tesline Lakes and a series of four interior cirque levels spaced some 100 m apart on massifs of the continental flank of the Boundary Range provide further teleconnectional evidence of mid and late Wisconsinan glaciations.

Our palynological and periglacial research provides an interpretation of Holocene glacio-climatic events with the Holocene initiated between 9400 and 10,000 years BP. Evidence here includes an array of peat bogs and relict palsen and peat plateau above 300 feet (900 m) elevation in the interior areas, as well as relict stone rings and other structured ground at and above this level. Some new plasen [sic] are developing in the present cooling trend of the Cordilleran Little Ice Age and active permafrost features are found above 5000 feet (1500 m).

The Wisconsinan and Holocene chronology is tabulated with correlations suggested from other areas in North America. In terms of Pleistocene stratigraphy of the Alaska coast, the main morph-erosional and morphostratigraphic sequences, abetted by available time-stratigraphic evidence, are sub-divided into early, middle and late Wisconsinan stages. These form the early Wisconsinan Juneau/Atlin and the mid-Wisconsinan Gastineau/Sloko stages and the late Wisconsinan Douglas/Inklin and Salmon Creek/Zohini stages. Inland the north-western B.C. counterparts are called the Pre-Atlin I (pre-classical) Wisconsinan stage; the Atlin I/Gladys I stage of the middle Wisconsinan and the Atlin II/Gladys II stage of late middle Wisconsinan. On the basis of sequence, the latter two should be equivalents of the Port Huron and Valders glaciations of the mid-continent chronology.

Location: AEU SCI QE 696 Q25
Area: Eastern Beringia, British Columbia - northwestern, Yukon - southwestern, Alaska - southeastern
Topics: Glacial history, Stratigraphy, Glacial geomorphology, Periglacial features, Plant macrofossils - peat, Sea level changes, Molluscs

Morison, S. R.

1989 Late Cenozoic Stratigraphy and Sedimentology of Gravelly Deposits in Central and Southern Yukon. In *Late Cenozoic History of the Interior Basins of Alaska and the Yukon*, edited by L. D. Carter, T. D. Hamilton and J. P. Galloway, pp. 66-71. Circular 1026. United States Geological Survey.

Location: AEU SCI QE 75 C57
Area: Eastern Beringia, Yukon - central, Yukon - southern
Topics: Stratigraphy, Glacial history - Yukon, Sedimentology - placer gravels

Morlan, R. E.

1979 A Stratigraphic Framework for Pleistocene Artifacts from Old Crow River, Northern Yukon Territory. In *Pre-Llano Cultures of the Americas: Paradoxes and Possibilities*, edited by R. L. Humphrey and D. Stanford, pp. 125-145. The Anthropological Society of Washington, Washington, D.C.

Location: AEU HSS E 61 P92
Area: Eastern Beringia, Yukon - northern
Topics: Palaeontological sites - Old Crow, Bone modification, Geoarchaeology, Glacial history - Yukon, Periglacial features - fossil ice wedges, Plant macrofossils - peat, Faunal remains - *Bison crassicornis*, Molluscs, Insect macrofossils, Plant macrofossils - wood, Faunal remains - *Spilogale*, Palaeontological sites - Old Crow, Plant macrofossils - *Najas flexilis*, Plant macrofossils - *Picea*, Climate history - Yukon, Faunal remains - Yukon, Plant macrofossils, Glacial lake sequences - Old Crow, Dating - analysis of radiocarbon dates

Naeser, N. D., J. A. Westgate, O. L. Hughes, and T. L. Péwé

1982 Fission-Track Ages of Late Cenozoic Distal Tephra Beds in the Yukon Territory and Alaska. Canadian Journal of Earth Sciences 19:2167-2178.

Six distal tephra beds from the Yukon Territory and Alaska have been dated by the fission-track method. Zircon and glass ages were determined for the Fort Selkirk and Lost Chicken tephra beds, but only glass ages for the others.

Assuming that no track fading has occurred in the glass, Old Crow and Dawson tephra beds are younger than 120 000 and 52 000 years BP, respectively. Mosquito Gulch tephra is 1.22 Ma old, Fort Selkirk tephra is about 1 Ma old, and Ester Ash Bed is 0.45 Ma old, and the best estimate of the age of Lost Chicken tephra is the range 1.7-2.6 Ma.

It is evident from these results and from the known abundance of tephra beds within late Cenozoic deposits of the Yukon Territory and Alaska that application of the fission-track method to distal tephra, in conjunction with detailed characterization studies, offers great potential for elucidation of the late Cenozoic geologic history of Alaska and the Yukon Territory.

Location: AEU SCI QE 1 C212
Area: Eastern Beringia, Yukon, Alaska
Topics: Dating - fission track, Tephra - fission track dating, Tephra - Old Crow, Stratigraphy, Loess, Glacial history, Tephra - composition, Tephra - Fort Selkirk, Tephra - Lost Chicken, Tephra - Mosquito Gulch, Tephra - Ester, Palaeomagnetism, Faunal remains, Plant macrofossils, Pollen records

Nichols, D. R.

1989 Pleistocene Glacial Events, Southeastern Copper River Basin, Alaska. In *Late Cenozoic History of the Interior Basins of Alaska and the Yukon*, edited by L. D. Carter, T. D. Hamilton and J. P. Galloway, pp. 78-80. Circular 1026. United States Geological Survey.

Location: AEU SCI QE 75 C57
Area: Eastern Beringia, Alaska - southeastern
Topics: Glacial history - Alaska, Stratigraphy

Peck, B. J., D. S. Kaufman, and P. E. Calkin

1990 Relative Dating of Moraines Using Moraine Morphometric and Boulder Weathering Criteria, Kigluaik Mountains, Alaska. Boreas 19:227-239.

Six measurements of surface-boulder weathering and seven measures of moraine morphometrics were taken at 57 sites in the Kigluaik Mountains, Alaska, to test the morphostratigraphic division of five Quaternary glacial units, to test a threefold subdivision of the late Pleistocene glacial unit, and to estimate the timing of glacial advances. Group means from 70% of the relative-age measures exhibit a positive relationship with relative age of the glacial units. The measures most effective at differentiating between moraine groups were: boulder frequency, tall-boulder frequency, boulder height, distal slope, and boulder angularity. Results of discriminant analysis indicate that moraine-morphometric measures provided slightly better classification results than those of boulder weathering. Discriminant analysis correctly classified 89% of the *a priori* grouped sites. Multivariate analysis supports the attempted threefold subdivision of the latest Pleistocene Mount Osborn moraines at the 0.056 level of significance. Estimated ages of 60,000 BP for the Salmon Lake and 165,000 BP for the Stewart River glacial units were interpolated by using the relative-age data and ages of 18,000 BP for the Mount Osborn and 810,000 BP for the Nome River units.

Location: AEU SCI QE 696 B73
Area: Eastern Beringia, Alaska - western
Topics: Dating - weathering, Dating - morphometry, Multivariate statistics, Glacial geomorphology - moraines

Péwé, T. L.

1983 The Periglacial Environment in North America During Wisconsin Time. In *Late-Quaternary Environments of the United States Volume 1 The Late Pleistocene*, edited by S. C. Porter, pp. 157-189. University of Minnesota Press, Minneapolis, Minnesota.

Notes: H. E. Wright Jr. (series ed.).
Location: AEU SCI QE 696 L35
Area: Alaska, Eastern Beringia
Topics: Review of periglacial environments - Eastern Beringia, Periglacial features, Permafrost

1989 Quaternary Stratigraphy of the Fairbanks Area, Alaska. In *Late Cenozoic History of the Interior Basins of Alaska and the Yukon*, edited by L. D. Carter, T. D. Hamilton and J. P. Galloway, pp. 72-77. Circular 1026. United States Geological Survey.

Location: AEU SCI QE 75 C57
Area: Eastern Beringia, Alaska - central
Topics: Stratigraphy, Tephra - Sheep Creek, Tephra - Old Crow, Tephra - Ester, Tephra - Chataniku, Tephra - Dome, Tephra - White River, Loess, Loess - dating, Dating - TL, Periglacial features, Faunal remains - *Praeovibos*, Plant macrofossils - wood, Dating - fission track

Porter, S. C.

1966 *Pleistocene Geology of Anaktuvuk Pass, Central Brooks Range, Alaska.* Arctic Institute of North America Technical Paper No. 18. Washington. 100 pp.

Anaktuvuk Pass, a broad low valley at the crest of the north-central Brooks Range, underwent intensive alpine glaciation during the later part of the Pleistocene Epoch. Ice of the last major glaciation, the Itkillik, flowed north from an ice divide south of the present stream-drainage divide and formed a broad piedmont lobe beyond the north front of the range. At Itkillik maximum Anaktuvuk Pass was buried under ice to a minimum depth of 2,000 feet. The Anivik Lake readvance, which occurred during the final phases of glacier recession, produced a prominent end moraine that crosses the floor of the Anaktuvuk Valley north of the pass. Extensive ice-contact topography behind the moraine points to subsequent stagnation and rapid wastage of the glacier as the climate became noticeably milder. Radiocarbon dates indicate that the Itkillik glaciation can be correlated broadly with the late (classical) Wisconsin glaciation of central North America. Two post-Wisconsin episodes of valley glaciation, the Alapah Mountain and Fan Mountain, were restricted to cirque

valleys in the higher parts of the range. Modern alpine glaciers, which appear to be in a state of disequilibrium, are shrunken remnants of more extensive Fan Mountain glaciers.

Comparison of altitudes of Itkillik cirque floors, altitudes of modern glaciers, and deduced and measured altitudes of the modern snowline suggest that the meteorological pattern at Itkillik maximum was similar to that of today; the main difference was a mean summer temperature which was at least 3.8°C lower than today. Abundant evidence points to a recent warming of the climate that has promoted widespread melting of ground ice, northward extension of floral and faunal habitats, and recession and thinning of existing glaciers. Close agreement between dated climatic events at Anaktuvuk Pass and those from other parts of North America supports the concept of widespread synchrony of late-Pleistocene climatic change throughout the continent.

Location: AEU SCI QE 696 P84
Area: Eastern Beringia, Alaska - northern
Topics: Glacial history - Alaska, Glacial geomorphology, Stratigraphy, Climate history - Alaska

Rampton, V. N.

1987 Late Wisconsin Deglaciation and Holocene River Evolution near Fort Nelson, Northeastern British Columbia. Canadian Journal of Earth Sciences 24:188-191.

Glacial lakes were formed in the Fort Nelson area by eastward-retreating Laurentide glacier ice that dammed a number of streams. These lakes drained through spillways at progressively lower elevations as the ice retreated eastward. A terrace on the Muskwa River containing sediments dated ca. 9000 years BP indicates that the river had entrenched itself between 50 and 70 m below the surrounding upland by that time. Prior to final entrenchment by the Muskwa River to its present grade, a pause in downcutting ca. 9000 years BP occurred, resulting in the formation of the terrace.

Location: AEU SCI QE 1 C212
Area: British Columbia - northeastern
Topics: Geomorphology - terraces, Glacial history, Glacial lake sequences, Plant macrofossils - peat

Reeves, B. O. K.

1973 The Nature and Age of the Contact between the Laurentide and Cordilleran Ice Sheets in the Western Interior of North America. Arctic and Alpine Research 5:1-16.

The presumed existence of a single mass of coalesced Cordilleran and Laurentide ice during most of late Wisconsin time is central to many archaeological hypotheses on the peopling of the New World. The area under concern is a 2,400–km belt of the Western Interior Plains and adjacent mountains, extending from the 49th parallel to the Arctic Ocean. Multiple Cordilleran glaciation occurred in the Rocky Mountain area during both late and early Wisconsin time. Radiocarbon dates indicate the mountain valleys were largely ice-free by 10,500 BP. Multiple Laurentide glaciation also is well established, the last advances in southern Alberta (late Wisconsin) having terminated east of the mountain front. Southern Alberta and southwestern Saskatchewan were ice-free by ca. 15,000 BP. Incontravertible evidence for coalescence west of the late Wisconsin ice front comes only from the Athabasca Valley, where Roed found that the two glaciers coalesced and flowed southeast. This event occurred either in early Wisconsin or Illinoian time. Since then the western border of the plains of Alberta has remained ice-free.

Location: AEU SCI G 1 A68
Area: Eastern Beringia, Canada - western, Yukon, Northwest Territories - western
Topics: Review of glacial history - Canada - western, Ice-free corridor, Human migration, Ice limit reconstruction, Dating - analysis of radiocarbon dates

Riehle, J. R., D. H. Mann, D. M. Peteet, D. R. Engstrom, D. A. Brew, and C. E. Meyer

1992 The Mount Edgecumbe Tephra Deposits, a Marker Horizon in Southeastern Alaska near the Pleistocene-Holocene Boundary. Quaternary Research 37:183-202.

Late Pleistocene tephra deposits found from Sitka to Juneau and Lituya Bay are assigned to a source at the Mount Edgecumbe volcanic field, based on similarity of glass compositions to near-vent deposits and on thinning away from Kruzof Island. The sequence of near-vent layers is basaltic andesite and andesite at the base, rhyolite, and mixed dacite and rhyolite on top. The only breaks in the tephra sequence are two 1-mm-thick silt partings in a lake-sediment core, indicating a depositional interval from basaltic andesite to dacite of no more than about a millennium. Tephra deposits at sites >30 km from the vent are solely dacite and rhyolite and are 10,600 to 11,400 ^{14}C yr old based on interpretation of 18 radiocarbon ages, including 5 by accelerator mass spectrometry (AMS). Basaltic andesite and andesite deposits nearer the vent are as much as 12,000 yr old.

Discrepancy among radiocarbon ages of upland tephra deposits provisionally correlated as the same grainfall is resolvable within $\pm$ 2 σ of analytical uncertainty. Comparison of bulk and AMS ages in one sediment core indicates a systematic bias of +600 to +1100 yr for the bulk ages; correlation of tephra deposits among upland and lacustrine sites implies an additional discrepancy of 200-400 yr between upland (relatively too young) and lacustrine ages. In any case, the Mount Edgecumbe tephra deposits are a widespread, latest Pleistocene stratigraphic marker that serves to emphasize the uncertainty in dating biogenic material from southeastern Alaska.

Location: AEU SCI QE 696 Q24
Area: Eastern Beringia, Alaska - southeastern
Topics: Tephra - Mount Edgecumbe, Tephra - electron microprobe analysis, Tephra - glass composition, Dating - analysis of radiocarbon dates

Rutter, N. W.

1976 Multiple Glaciation in the Canadian Rocky Mountains with Special Emphasis on Northeastern British Columbia. In *Quaternary Stratigraphy of North America*, edited by W. C. Mahaney, pp. 409-440. Dowden, Hutchinson & Ross, Inc., Stroudsburg, Pennsylvania.

The completion of the W.A.C. Bennett Dam in 1968 has resulted in the formation of Williston Lake in parts of the Peace, Finlay, and Parsnip River valleys of northeastern British Columbia. Prior to flooding, extensive well-preserved glacial deposits revealed evidence for four glacial advances. Since flooding, many of the key sections along the banks of the rivers have been lost to the record.

The oldest unconsolidated sediments are oxidized gravel and sand that underlie the oldest major till unit. These are interpreted as interglacial fluvial deposits. With the onslaught of the Early advance, outwash was deposited in the major river valley systems. Early till is recognized in the Finlay and Parsnip River valleys (Rocky Mountain Trench), so the advance was relatively extensive, with most ice originating west of the Rocky Mountain Trench. During deglaciation, glaciofluvial and glaciolacustrine sediments were laid down. The next advance, Early Portage Mountain, extended from west of the Rocky Mountain Trench, across the Trench into the Rockies, and out into the plateau area to the east. During deglaciation, a lake formed to the east, probably damned by Laurentide ice. Glaciofluvial and glaciolacustrine sediments were again deposited. When retreat was complete to at least the upper parts of the Parsnip and Finlay River valleys, the Late Portage Mountain advance occurred. This time the glaciation was less extensive and the ice was topographically controlled. It flowed down the Parsnip and Finlay River valleys and out through the Peace River valley, terminating at about Portage Mountain where an end moraine was constructed. The end moraine consists of deltaic gravel and sand, and was formed in a lake that, once again, was damned by Laurentide ice farther east. During deglaciation, glaciolacustrine and glaciofluvial sediments were deposited in the valley systems to beyond the boundaries of the investigated area. In the Portage Mountain area, varying lake levels are indicated by eroded surfaces and beaches. Sometime after deglaciation, Deserter's Canyon advance occurred. This was a minor event, whose till is observed with certainty only northwest of the mapped area.

Radiocarbon dates indicate that the Early and Late Portage Mountain advances and the Deserter's Canyon advance are of Late Wisconsin Age. The Early advance and the underlying interglacial deposits are most likely Early Wisconsin or older.

Tentative correlations between glacial advances or equivalent till units in the Canadian Rocky Mountains and western plains are presented.

Location: AEU SCI QE 696 Q25
Area: British Columbia - northeastern

Topics: Glacial history, Stratigraphy, Pollen records, Plant macrofossils - wood, Plant macrofossils - peat, Glacial geomorphology, Glacial lake sequences, Dating - analysis of radiocarbon dates, Faunal remains - *Mammuthus*, Faunal remains - *Ovis*

1978 Geology of the Ice-Free Corridor. In *AMQUA, 5th Biennial Meeting, Edmonton, Alberta, Abstracts*, pp. 2-12.

Location: AEU HSS QE 696 A5212
Area: Eastern Beringia, British Columbia - northeastern, Northwest Territories - western, Yukon
Topics: Ice-free corridor, Stratigraphy, Glacial history, Human migration

1980 Late Pleistocene History of the Western Canadian Ice-Free Corridor. Canadian Journal of Anthropology 1(1):1-8.

Recent investigations of the relationship between Pleistocene Cordilleran and Laurentide glaciers suggest that the ice-free corridor was closed for a relatively short period during Wisconsin Glaciation. The corridor could have been closed sometime during Early Wisconsin (approximately 100,000-120,000 to approximately 50-70,000 years B.P.) although little is known about glacial events during this period. It was most likely open during the Middle Wisconsin. During Late Wisconsin time (approximately 10,000 to 25,000 years B.P.) the corridor was probably open from about the U.S.-Canadian border to the Jasper-Edmonton area, closed for a period from the Jasper-Edmonton area northward to the B.C.-Alberta border and open beyond to the Arctic Ocean. Man could have migrated freely in this region during most of the Wisconsin.

Notes: See Rutter 1978 (5th AMQUA abstract).
Location: AEU PMC GN 1 C22
Area: Eastern Beringia, British Columbia - northeastern, Yukon, Northwest Territories - western
Topics: Review of glacial history - Canada - western, Glacial lake sequences, Glacial geomorphology, Stratigraphy, Ice-free corridor, Human migration, Dating - analysis of radiocarbon dates

Ryder, J. M., and D. Maynard

1991 The Cordilleran Ice Sheet in Northern British Columbia. Géographie physique et Quaternaire 45:355-363.

Dates from lavas associated with tills and erratics indicate that ice-sheet glaciations occurred between 4 and 0.6 Ma BP. The few radiocarbon dates that are available suggest that the chronology of the Late Wisconsinan (Fraser Glaciation) ice sheet of northern British Columbia was similar to that of the southern part of the province. During what may have been a long, early phase of this glaciation, Glacial Lake Stikine was dammed by advancing valley glaciers in the Coast Mountains, and alpine glaciers developed on the intermontane plateau. At the climax of Fraser Glaciation, ice-flow patterns were dominated by outflow from a névé centred over the northern Skeena Mountains. Deglaciation occurred partly by frontal retreat of ice tongues and partly by downwasting of stagnant ice. Recessional moraines mark one or more resurgences or stillstands of the ice margin. During deglaciation, Stikine River valley was occupied by an active outlet glacier and a major subglacial drainage system.

Location: AEU SCI G 1 R452
Area: British Columbia - northern
Topics: Review of glacial history - British Columbia - northeastern, Glacial geomorphology

Sainsbury, C. L.

1967 Quaternary Geology of Western Seward Peninsula, Alaska. In *The Bering Land Bridge*, edited by D. M. Hopkins, pp. 121-143. Stanford University Press, Stanford, California.

... The Pleistocene history of the western Seward Peninsula, as outlined in this paper, is generally compatible with the conclusions of Hopkins and others regarding Wisconsin time (except for the extent of ice), but is clearly incompatible with an extension of these conclusions into early Illinoian time (and earlier), particularly regarding the eastern Bering Strait area of the land bridge. Prior to the uplift of the York terrace, the Bering Strait was probably a seaway during all parts of Pleistocene time, during which sea level lay within 100 meters of its present level. If sea level were eustatically lowered more than 100 meters, Bering Strait would be gripped in the most severe parts of a glacial stage, and much of eastern Siberia and the Bering Strait probably would have been covered by ice. It is probable, then, that any land migrations by animals and plants across the Bering Strait, were restricted to Wisconsin time; even then the extreme climatic severity and large ice sheets may have prevented any migration of animals. During the earlier Pleistocene, the migrations by land, ... most probably would have been along a route considerably south of the Bering Strait, and could have been via St. Lawrence Island. ...

Notes: Based on a Symposium held at the VII Congress of the International Association for Quaternary Research (INQUA), Boulder, Colorado, 1965. Final section abbreviated for abstract.
Location: AEU SCI QE 39 H79
Area: Eastern Beringia, Alaska - western
Topics: Beringian land bridge connection, Tectonism, Stratigraphy, Sea level changes, Glacial history - Alaska, Glacial geomorphology, Geomorphology - terraces, Molluscs - marine, Erratics

Schweger, C. E.

1989 The Old Crow and Bluefish Basins, Northern Yukon: Development of the Quaternary History. In *Late Cenozoic History of the Interior Basins of Alaska and the Yukon*, edited by L. D. Carter, T. D. Hamilton and J. P. Galloway, pp. 30-33. Circular 1026. United States Geological Survey.

Location: AEU SCI QE 75 C57
Area: Eastern Beringia, Yukon - northern
Topics: Stratigraphy, Glacial history - Yukon, Tephra - Old Crow, Palaeomagnetism, Tephra - Surprise Creek, Tephra - fission track dating, Dating - fission track, Pollen records - Yukon

1993 Quaternary Paleoecology of Beringian Tephras. In *GAC/MAC Joint Annual Meeting, Edmonton, Program and Abstracts*, Vol. 18, p. A-94.

Location: AEU SCI QE 1 G333
Area: Eastern Beringia
Topics: Pollen records, Tephra - Old Crow, Tephra - Little Timber, Tephra - Surprise Creek, Tephra - Sheep Creek, Vegetation history

Smith, C. A. S., C. Tarnocai, and O. L. Hughes

1985 Pedological Investigations of Pleistocene Glacial Drift Surfaces in the Central Yukon. In *CANQUA Symposium on the Paleoenvironmental Reconstruction of the Late Wisconsin Deglaciation and the Holocene, Lethbridge, Program-with-Abstracts and Field Guide*, p. 58.

Area: Eastern Beringia, Yukon - central
Topics: Glacial history - Yukon, Palaeosols

Smith, D. G.

1990 Paleogeography of Glacial Lake Mackenzie, N. W. T. In *CAG, 1990 Annual Meeting, Edmonton, Alberta, Programme and Abstracts*, p. 178.

Area: Eastern Beringia, Northwest Territories - western
Topics: Glacial lake sequences - Glacial Lake Mackenzie

1992 Glacial Lake Mackenzie, Mackenzie Valley, Northwest Territories, Canada. Canadian Journal of Earth Sciences 29:1756-1766.

Glacial Lake Mackenzie, located in the middle reach of the Mackenzie Valley, extended 800 km as a long narrow lake between the Rabbitskin River, 50 km east of Fort Simpson, and the Ramparts cliffs near Fort Good Hope; part of the lake extended an additional 75 km west from the Ramparts. The lake averaged 15 km in width, but broadened to 75 km in the northern sector and 50 km near Fort Norman, and narrowed to 5 km near Wrigley. The depth was at least 80 m in the Fort Norman region and 60 m near Wrigley. Radiocarbon ages suggest that the lake had formed in the northwest by 11 760 BP, and that the last phase of the lake occurred in the south near Camsell Bend no later than 10 290 BP. The lake formed as a result of a bedrock (limestone) barrier at the Ramparts near Fort Good Hope and glacial depression of the basin. The demise of the lake is ascribed to outlet incision into the limestone barrier, sediment filling, and isostatic rebound. Differential postglacial rebound raised the Fort Simpson region at least 97 m higher than the Ramparts over the past 11 500 years.

Location: AEU SCI QE 1 C212
Area: Northwest Territories - western, Eastern Beringia
Topics: Glacial lake sequences - Glacial lake Mackenzie, Stratigraphy, Glacial history - Northwest Territories, Plant macrofossils - peat, Plant macrofossils - wood, Sedimentology

Stalker, A. M.

1970 Late Wisconsin Glaciation, and the Yukon-Alberta Ice-Free Corridor. In *AMQUA, 1st Biennial Meeting, Abstracts*, p. 126.

Location: AEU HSS QE 696 A52
Area: Eastern Beringia, Yukon
Topics: Ice-free corridor, Glacial history, Human migration

Tarnocai, C.

1989 Paleosols of Northwestern Canada. In *Late Cenozoic History of the Interior Basins of Alaska and the Yukon*, edited by L. D. Carter, T. D. Hamilton and J. P. Galloway, pp. 39-44. Circular 1026. United States Geological Survey.

Location: AEU SCI QE 75 C57
Area: Eastern Beringia, Yukon - central, Yukon - northern
Topics: Palaeosols, Climate history, Pollen records, Plant macrofossils - *Picea*

Thorson, R. M.

1989 Late Quaternary Paleofloods Along the Porcupine River, Alaska: Implications for Regional Correlation. In *Late Cenozoic History of the Interior Basins of Alaska and the Yukon*, edited by L. D. Carter, T. D. Hamilton and J. P. Galloway, pp. 51-54. Circular 1026. United States Geological Survey.

Location: AEU SCI QE 75 C57
Area: Eastern Beringia, Alaska - eastern
Topics: Palaeofloods

Thorson, R. M., and G. Bender

1985 Eolian Deflation by Ancient Katabatic Winds: A Late Quaternary Example from the North Alaska Range. Geological Society of America Bulletin 96:702-709.

Strong katabatic winds are frequently generated in glaciated mountain valleys of the Alaska Range by downglacier gravitational flow of chilled air. Stronger katabatic winds probably occurred during late Quaternary time, when glaciers were more extensive, and such winds may have greatly influenced eolian sedimentation. In Nenana River valley and in most of adjacent Teklanika River valley, the entire 1- to 2-m-thick eolian cap is postglacial in age, and the beginning of loess deposition coincides almost exactly with rapid recession of late Wisconsin ice. Previously deposited loess and bluff-edge dunes were apparently deflated during the last glaciation between 25,000 and 12,000 yr B.P. Loess deposition in these mountain valleys thus is exclusively an interglacial phenomenon; glacial phases are characterized by deflation.

Meteorological modeling of katabatic winds generated during the last glaciation predicts that paleowind velocities greatly exceeded the entrainment thresholds required for eolian deflation. When both Nenana River and Teklanika River valleys are compared, theoretical differences in the potential for generating katabatic winds and differences in valley physiography explain why pre-Holocene loess is preserved in downstream reaches of Teklanika River valley and not Nenana River valley. The presence of strong katabatic winds in mountain valleys beyond former glacier limits has significant implications for late Pleistocene paleoecology and archeology.

Location: AEU SCI QE 1 G341
Area: Alaska - central, Eastern Beringia
Topics: Loess, Palaeowinds, Sedimentology, Stratigraphy, Glacial history - Alaska, Climate history - Alaska

Thorson, R. M., and E. J. Dixon Jr.
1983 Alluvial History of the Porcupine River, Alaska: Role of Glacial-Lake Overflow from Northwest Canada. Geological Society of America Bulletin 94:576-589.

The stratigraphy and morphology of alluvial terraces in the lower Porcupine Valley permit the definition of twelve river stages, each marked by distinctive surface characteristics, sediment composition, and regional gradient. Terraces that exhibit characteristics suggestive of extremely high discharge, such as coarse, bouldery, braided gravel surfaces and intense scouring, formed at times when the Porcupine River at the Ramparts acted as an overflow outlet for glacial lakes in northern Yukon Territory which had been impounded by the Laurentide ice sheet. Terraces capped by sediment suggestive of relatively low discharge meandering streams, and which were strongly affected by Coleen River drainage, probably formed when glacial-lake overflow did not occur. Ten radiocarbon dates on alluvial sediments from the lower Porcupine River range from greater than 35,000 to 2,350 $\pm$ 55 yr B.P. When combined with geomorphologic interpretations on terraces in Alaska and with radiocarbon dates from northern Yukon Territory, these dates suggest repeated glaciolacustrine inundations of the Old Crow and Bluefish Basins during Wisconsinan time.

Location: AEU SCI QE 1 G341
Area: Eastern Beringia, Yukon - northern, Alaska - northern
Topics: Stratigraphy, Glacial history, Glacial lake sequences, Plant macrofossils, Dating - analysis of radiocarbon dates, Geomorphology - terraces, Sedimentology

Thorson, R. M., and R. D. Guthrie
1992 Stratigraphy of the Colorado Creek Mammoth Locality, Alaska. Quaternary Research 37:214-228.

The Colorado Creek mammoth locality in west-central Alaska contains the remains of two mammoths that were scavenged by carnivores. Sedimentologic interpretations of the reworked eolian deposits surrounding the bones, supplemented by 10 radiocarbon dates, indicate that the lower and upper mammoths died and were buried within separate, but superimposed, thaw gullies about 23,000 and 16,000 yr ago, respectively. From our results, we propose a polycyclic taphonomic model for thaw gullies governed largely by slope aspect, rather than regional climate, and in which mixing between faunal horizons is more likely than not. Variations in the rate of silt influx and the position of the permafrost table provide a paleoclimatic proxy record that can be correlated to other records in eastern Beringia.

Location: AEU SCI QE 696 Q24
Area: Eastern Beringia, Alaska - central
Topics: Faunal remains - *Mammuthus*, Taphonomy, Stratigraphy, Loess, Plant macrofossils - peat, Aeolian deposits, Periglacial features, Tephra - Alaska, Dating - analysis of radiocarbon dates

Thorson, R. M., and T. D. Hamilton

1977 Geology of the Dry Creek Site: A Stratified Early Man Site in Interior Alaska. Quaternary Research 7:149-176.

The Dry Creek archeologic site contains a stratified record of late Pleistocene human occupation in central Alaska. Four archeological components occur within a sequence of multiple loess and sand layers which together form a 2-m cap above weathered glacial outwash. The two oldest components appear to be of late Pleistocene age and occur with the bones of extinct game animals. Geologic mapping, stratigraphic correlations, radiocarbon dating, and sediment analyses indicate that the basal loess units formed part of a widespread blanket that was associated with an arctic steppe environment and with stream aggradation during waning phases of the last major glaciation of the Alaska Range. These basal loess beds contain artifacts for which radiocarbon dates and typologic correlations suggest a time range of perhaps 12,000-9000 yr ago. A long subsequent episode of cultural sterility was associated with waning loess deposition and development of a cryoturbated tundra soil above shallow permafrost. Sand deposition from local source areas predominated during the middle and late Holocene, and buried Subarctic Brown Soils indicate that a forest fringe developed on bluff-edge sand sheets along Dry Creek. The youngest archeologic component, which is associated with the deepest forest soil, indicates intermittent human occupation of the site between about 4700 and 3400 ^{14}C yr BP.

Location: AEU SCI QE 696 Q24
Area: Eastern Beringia, Alaska - central
Topics: Archaeological sites - Dry Creek, Palaeosols, Loess, Aeolian deposits, Faunal remains - Alaska, Glacial history - Alaska, Sedimentology, Lithics, Geoarchaeology, Stratigraphy, Dendrochronology, Dating - analysis of radiocarbon dates

Vincent, J. S.

1989 Continental Ice Advances in Northwestern Canada and their Significance to Interior Basins in the Yukon. In *Late Cenozoic History of the Interior Basins of Alaska and the Yukon*, edited by L. D. Carter, T. D. Hamilton and J. P. Galloway, pp. 18-21. Circular 1026. United States Geological Survey.

Location: AEU SCI QE 75 C57
Area: Eastern Beringia, Yukon, Northwest Territories
Topics: Glacial history, Glacial lake sequences

Ward, B. C., and L. E. Jackson Jr.

1992 Late Wisconsinan Glaciation of the Glenlyon Range, Pelly Mountains, Yukon Territory, Canada. Canadian Journal of Earth Sciences 29:2007-2012.

Airphoto analysis, identification of erratics, and stratigraphic and geomorphic investigations were used to determine the nature of McConnell (Late Wisconsinan) age glaciation in the Glenlyon Range, Yukon Territory. Most of the peaks of the Glenlyon Range were nunataks within the Selwyn Lobe of the Cordilleran Ice Sheet. The configuration of local and Selwyn Lobe moraines indicates that local glaciers did not extend beyond the cirques and made no contribution to the Selwyn Lobe. These conclusions are confirmed by the character of sediments examined in sections along Little Sheep Creek and by the distribution of erratics in one of the cirque valleys. Aridity limited local ice growth; large glaciers did not grow because of insufficient precipitation.

Location: AEU SCI QE 1 C212
Area: Eastern Beringia, Yukon - central
Topics: Glacial history - Yukon, Stratigraphy, Glacial geomorphology

Waythomas, C. F., P. D. Lea, and R. C. Walter

1993 Stratigraphic Context of Old Crow Tephra, Holitna Lowland, Interior Southwest Alaska. Quaternary Research 40:20-29.

A thick deposit of Old Crow tephra was discovered in a bluff exposure along the middle Holitna River near the Kulukbuk Hills (61°20'N latitude, 157°10'W longitude) in interior southwest Alaska. This locality is the southwesternmost-known deposit of Old Crow tephra in Alaska. Thickness and grain-size data from this site support a source volcano in the eastern Aleutian arc. Pleistocene stratigraphic sequences in the lowland are dominated by upward-fining eolian sand-sheet deposits and loess separated by organic silt. These deposits record at least two episodes of regional glaciation and an intervening nonglacial period (marine oxygen isotope stage 3, stage 5, or both). Old Crow tephra crops out near the top of the lower upward-fining eolian unit, indicating that the ash erupted near the end of an interval of periglacial eolian sedimentation. The sequence of eolian deposits that contain Old Crow tephra probably accumulated during the latter part of marine oxygen isotope stage 6, whereas the overlying eolian sequence formed during the last glaciation (stage 2). This stratigraphic position is consistent with other stratigraphic contexts for the tephra and with fission-track and thermoluminescence ages of ca. 140,000 ± 10,000 B.P.

Location: AEU SCI QE 696 Q24
Area: Eastern Beringia, Alaska - southwestern
Topics: Dating - analysis of radiocarbon dates, Sedimentology, Tephra - composition, Tephra - Old Crow, Stratigraphy, Aeolian deposits, Glacial history - Alaska, Tephra - dating, Periglacial features, Pollen records - Alaska, Pollen analysis - Alaska, Plant macrofossils, Plant macrofossils - *Salix*, Insect macrofossils

Westgate, J. A., T. D. Hamilton, and M. P. Gorton
1983 Old Crow Tephra: A New Late Pleistocene Stratigraphic Marker Across North-Central Alaska and Western Yukon Territory. Quaternary Research 19:38-54.

Old Crow tephra is the first extensive Pleistocene tephra unit to be documented in the northwestern part of North America. It has a calc-alkaline dacitic composition with abundant pyroxene, plagioclase, and Fe-Ti oxides, and minor hornblende, biotite, apatite, and zircon. Thin, clear, bubble-wall fragments are the dominant type of glass shard. This tephra can be recognized by its glass and phenocryst compositions, as determined by X-ray fluorescence, microprobe, and instrumental neutron activation techniques. It has an age between the limits of 60,000 and 120,000 yr, set by ^{14}C and fission-track measurements, respectively.

Old Crow tephra has been recognized in the Koyukuk Basin and Fairbanks region of Alaska, and in the Old Crow Lowlands of the northern Yukon Territory, some 600 km to the east-northeast. The source vent is unknown, but these occurrences, considered in relation to the distant locations of potential Quaternary volcanic sources, demonstrate the widespread distribution of this tephra and underscore its importance as a regional stratigraphic marker.

Location: AEU SCI QE 696 Q24
Area: Eastern Beringia, Yukon, Alaska
Topics: Tephra - Old Crow, Stratigraphy, Periglacial features - fossil ice wedges, Dating - fission track, Tephra - fission track dating, Plant macrofossils - wood, Palaeomagnetism, Tephra - composition

Westgate, J. A., R. C. Walter, G. W. Pearce, and M. P. Gorton
1985 Distribution, Stratigraphy, Petrochemistry, and Palaeomagnetism of the Late Pleistocene Old Crow Tephra in Alaska and the Yukon. Canadian Journal of Earth Sciences 22:893-906.

The late Quaternary Old Crow tephra is a two-pyroxene, calc-alkaline dacite whose known areal extent is broadly delimited by a triangle with apices at the Seward Peninsula, the Wrangell Mountains, and the Old Crow Basin in the northern Yukon. Everywhere the tephra is fine grained ($Md\sigma = 5.33 \pm 0.32$) and moderately to poorly sorted ($6\sigma = 1.33 \pm 0.29$). Samples from the extremities of the fall-out zone have similarity coefficients of 0.95.

A palaeomagnetic excursion is recorded in sediments just below Old Crow tephra in the Fairbanks area and at Imuruk Lake on the Seward Peninsula. A short, full reversal of the magnetic field has been preserved at the corresponding stratigraphic level near Old Crow in the northern Yukon. Chronological controls based on ^{14}C and fission-track dates and sedimentation rates show that these palaeomagnetic features are almost certainly partial records of the complex geomagnetic Blake Event, which occurred 100-120 ka ago.

New petrochemical data demonstrate that the source of Old Crow tephra is in the eastern Aleutian arc.

Location: AEU SCI QE 1 C212
Area: Eastern Beringia, Alaska, Yukon
Topics: Tephra - Old Crow, Dating - fission track, Tephra - composition, Palaeomagnetism, Stratigraphy

Williams, J. R.

1986 New Radiocarbon Dates from the Matanuska Glacier Bog Section. In *Geologic Studies in Alaska by the United States Geological Survey*, edited by S. Bartsch-Winkler and K. M. Reed, pp. 85-88. Circular 978. United States Geological Survey.

Location: AEU SCI QE 75 C57
Area: Eastern Beringia, Alaska - southern
Topics: Stratigraphy, Plant macrofossils - peat, Glacial history - Alaska, Dating - analysis of radiocarbon dates, Pollen records - Alaska

1989 A Working Glacial Chronology for the Western Copper River Basin, Alaska. In *Late Cenozoic History of the Interior Basins of Alaska and the Yukon*, edited by L. D. Carter, T. D. Hamilton and J. P. Galloway, pp. 81-84. Circular 1026. United States Geological Survey.

Location: AEU SCI QE 75 C57
Area: Eastern Beringia, Alaska - southeastern
Topics: Glacial history - Alaska, Stratigraphy, Faunal remains - *Mammuthus*, Glacial lake sequences

Yeend, W.

1989 Late Cenozoic Sedimentary History Along Major Fault Zones, Alaska. In *Late Cenozoic History of the Interior Basins of Alaska and the Yukon*, edited by L. D. Carter, T. D. Hamilton and J. P. Galloway, pp. 55-59. Circular 1026. United States Geological Survey.

Location: AEU SCI QE 75 C57
Area: Eastern Beringia, Alaska - central
Topics: Tectonism, Sedimentology - placer gravels

PART 3. LATE QUATERNARY PALAEOENVIRONMENTS

Ager, T.

1976 Discussion of "Arctic-Steppe - An Extinct Biome" by J. V. Matthews, Jr. In *AMQUA, 4th Biennial Meeting, Tempe, Arizona, Abstracts*, pp. 78-79.

Area: Eastern Beringia, Alaska
Topics: Archaeological sites - Dry Creek, Archaeological sites - Gallagher Flint Station, Vegetation history

1986 Ice-Marginal Vegetation Development in Southern Alaska During the Late Pleistocene and Early Holocene: Pollen Evidence from Cook Inlet Region. In *AMQUA, 9th Biennial Meeting, Champaign, Illinois, Program and Abstracts*, pp. 11-12.

Location: AEU HSS QE 696 A5212
Area: Eastern Beringia, Alaska - southern
Topics: Lake cores, Plant migration, Pollen analysis - Alaska, Vegetation history - Alaska

Ager, T. A.

1975 *Late Quaternary Environmental History of the Tanana Valley, Alaska*. Institute of Polar Studies Report No. 54. The Ohio State University Research Foundation, Columbus, Ohio. 117 pp.

Pollen histories from three lakes and a peat bog in the middle Tanana Valley, interior Alaska, provide a regionally-consistent record of vegetational changes spanning approximately the last 16,000 years. Lacustrine sediment cores from Birch Lake (64°19' N Lat., 146°40' W Long.) and Lake George (63°47' N Lat., 114°30' W Long.) yielded the oldest pollen records yet obtained from interior Alaskan lakes. Pollen spectra from the basal sections of these cores are assigned to Pollen Zone 1, and they are characterized by high percentages (20-50%) of both grass and sage (*Artemisia*) pollen, and lower but significant amounts of sedge and willow pollen. Zone 1 pollen spectra contain only a few percent of pollen of spruce, birch, and alder. The vegetation that produced Zone 1 pollen spectra was a steppe-tundra which probably covered the Tanana Lowland and much of the adjacent Yukon-Tanana Upland during full glacial conditions of the late Wisconsin, until about 14,000 radiocarbon years ago. Inferred climate during the time of steppe-tundra was significantly drier than at present, with a mean annual temperature at least several degrees colder than the present figure of -4°C. Increased continentality probably resulted in warm, dry summers of short duration, and long severe winters.

Pollen Zone 2 persisted from about 14,000 years ago until about 10,000 years ago. Zone 2 pollen spectra are characterized by very high percentages of dwarf birch pollen and lower but significant percentages of grass, sedge, and willow pollen. Zone 2 vegetation was a form of shrub tundra. The transition from Zone 1 to Zone 2 appears to have been abrupt and may reflect a sudden climatic change to warmer and moister conditions about 14,000 years ago. Absolute Pollen Influx data (API) show at least a 3-fold increase in the rate of pollen deposition in Zone 2 time over Zone 1 time.

Pollen Zone 3 is subdivided into Subzones 3A and 3B. Subzone 3A records the invasion of spruce into the region, beginning roughly 10,000 years ago. Most of the pollen histories from the region show a rather abrupt initial increase in spruce pollen percentages. The Birch Lake Core II record displays a more gradual initial increase however, which suggests that spruce trees did not actually reach the vicinity of Birch Lake, and perhaps the Fairbanks area, until about 9000 years B.P. The invasion of spruce probably proceeded along rivers initially, forming gallery forests surrounded by shrub tundra. By about 9000 years B.P. forests were evidently well-established in much of the region. The spruce invasion suggests a further climatic warming, but the radiocarbon chronology is not yet sufficiently detailed to pinpoint the time of initial increase in spruce pollen in the cores. Therefore, it is uncertain whether the invading spruce arrived from some distant refugium many years after the climate had become suitable in interior Alaska, or a few scattered spruce did survive in or near the Tanana Valley during the late Wisconsin glaciation and expanded their range immediately when climatic conditions allowed.

Subzone 3B spans the past 8400 years. The boundary between Subzones 3A and 3B is marked by an increase in alder percentages and the onset of a decline in spruce pollen percentages. Spruce pollen percentages and API continued to decline until about 7000 years B.P., perhaps as an indirect result of an interval of warmer, drier climate. Lowland vegetation of the region has undergone no significant change during the past 6500 years insofar as can be discerned from the pollen record.

Location: AEU SCI QE 931 A26
Area: Eastern Beringia, Alaska - central
Topics: Archaeological sites - Dry Creek, Archaeological sites - Healy Lake, Archaeological sites - Gallagher Flint Station, Geoarchaeology, Faunal remains - Alaska, Lake cores, Pollen analysis - Alaska, Palynological sites - Birch Lake, Palynological sites - Lake George, Vegetation history - Alaska, Climate history - Alaska

1980 A 16,000 Year Pollen Record from St. Michael Island, Norton Sound, Western Alaska. In *AMQUA, 6th Biennial Meeting, Orono, Maine, Abstracts and Program*, p. 3.

Location: AEU HSS QE 696 A5212
Area: Eastern Beringia, Alaska - western
Topics: Lake cores, Palynological sites - St. Michael Island, Pollen analysis, Vegetation history - Alaska, Climate history - Alaska, Vegetation history - *Populus*

1982 Vegetational History of Western Alaska During the Wisconsin Glacial Interval and the Holocene. In *Paleoecology of Beringia*, edited by D. M. Hopkins, J. V. Matthews Jr., C. E. Schweger and S. B. Young, pp. 75-93. Academic Press, New York, New York.

Lacustrine sediment cores from the Yukon Delta and St. Michael Island in Norton Sound, western Alaska, provide pollen records spanning about 24,000 and 16,000 years, respectively. Three pollen zones of regional significance have been recognized in these cores: a basal Herb Zone, an intermediate *Betula* Zone, and an uppermost *Alnus* Zone. These pollen assemblage zones are similar in both composition and sequence to those described from northern Alaska by D.A. Livingstone, but the vegetation changed much earlier in western Alaska. The Herb Zone pollen assemblages represent an herbaceous tundra vegetation in which Gramineae, Cyperaceae, *Salix*, *Artemisia*, and a variety of forbs were important elements. This herb-dominated vegetation covered most of the Beringian landscape during the Wisconsin glacial interval until about 14,000 years ago, when shrubs began to increase in some areas. The subsequent *Betula* Zone pollen assemblages record the expansion of a mesic shrub tundra vegetation including dwarf birch in the Yukon Delta region between about 14,000 and 6000 to 7000 years ago. This vegetation of *Betula nana*, ericales, *Salix*, and numerous herbs suggests a shift to a less continental climate characterized by increased moisture and probably warmer summer temperatures. The *Alnus* Zone records the rapid dispersal and establishment of *Alnus* shrubs within the mesic shrub tundra vegetation of the Yukon Delta beginning sometime between 7000 and 6000 years ago. *Picea* invaded the eastern fringes of this region about 5500 years ago, establishing riparian forests in the interior along the Yukon and Kuskokwim Rivers and some of their tributaries.

Pollen data from coastal exposures of perennially frozen loess and peat in the Bristol Bay region of southwestern Alaska provide an outline of vegetation history that roughly parallels that from the Yukon Delta region 400 km to the north. The Bristol Bay data, however, extend the record farther back in time beyond the limit of radiocarbon dating. Pollen spectra from the lowermost organic-matter-bearing units of the exposures are interpreted to represent a slightly mesic herb-shrub tundra that probably covered southwestern Alaska during the middle Wisconsin interstadial. During the late Wisconsin glacial interval, the climate became increasingly arid, and the vegetation of the Bristol Bay region shifted to a predominantly herbaceous tundra that included a few shrubs.

Location: AEU SCI QE 720 W47, AEA PMA/ASA 560.45 P174
Area: Alaska - western, Eastern Beringia
Topics: Beringian vegetation, Review of pollen studies - Alaska, Review of vegetation history - Alaska, Palynological sites - Tungak Lake, Palynological sites - Puyuk Lake, Pollen analysis - Alaska, Lake cores, Tephra - Alaska, Plant macrofossils, Vegetation history - *Picea*

1983 Holocene Vegetational History of Alaska. In *Late-Quaternary Environments of the United States Volume 2 The Holocene*, edited by H. E. Wright Jr., pp. 128-141. University of Minnesota Press, Minneapolis, Minnesota.

Location: AEU SCI QE 696 L35

Area: Eastern Beringia, Alaska, Aleutian Islands, Pribilof Islands
Topics: Review of pollen studies - Alaska, Review of vegetation history - Alaska, Plant migration, Pollen analysis - modern pollen spectra, Climate history - Alaska, Lake cores, Refugia

1989 History of Late Pleistocene and Holocene Vegetation in the Copper River Basin, South-Central Alaska. In *Late Cenozoic History of the Interior Basins of Alaska and the Yukon*, edited by L. D. Carter, T. D. Hamilton and J. P. Galloway, pp. 89-92. Circular 1026. United States Geological Survey.

Location: AEU SCI QE 75 C57
Area: Eastern Beringia, Alaska - southeastern
Topics: Plant macrofossils - peat, Pollen analysis - Alaska, Vegetation history - Alaska

Ager, T. A., and L. Brubaker

1985 Quaternary Palynology and Vegetational History of Alaska. In *Pollen Records of Late-Quaternary North American Sediments*, edited by V. M. Bryant Jr. and R. G. Holloway, pp. 353-384. American Association of Stratigraphic Palynologists Foundation, Dallas, Texas.

During several intervals of the Quaternary, eustatic lowering of sea level exposed large tracts of the shallow Bering and Chukchi Sea floors. This vast plain formed a broad land connection (Bering land bridge) between northeastern Asia and North America, permitting extensive biotic interchange between the continents. Half the area of Alaska remained unglaciated throughout the Quaternary, and therefore provided important refugia for plants and animals. Much of the palynological research in Alaska has been directed towards reconstructing the history of the Beringian environment, and the postglacial development of modern vegetation. Pollen data suggest that boreal forest and tundra vegetation had developed in Alaska by late-Pliocene time. A few sites from which pollen data of middle-Pleistocene age are available suggest that tundra vegetation existed in areas now covered by boreal forest. Late-Pleistocene records suggest that tundra and boreal forest environments coexisted in Alaska during the Sangamon Interglacial, but the severe climate of the Early Wisconsin glacial interval probably reduced or eliminated forests and replaced them with herbaceous tundra. The long Middle Wisconsin interstadial was characterized by oscillating climates and widespread tundra vegetation, with boreal forest or forest-tundra restricted to interior Alaska during the warmer intervals of the interstadial. The Late Wisconsin glacial interval was cold and arid. Trees and shrubs were rare and herbaceous tundra covered most of unglaciated Alaska. By 14,000 yrs. B.P. shrub tundra began to replace herbaceous tundra as climatic warming began. By 11,000 yrs. B.P. *Populus* spread widely in Alaska, followed by *Alnus* in early-Holocene time. Boreal *Picea* appeared in interior Alaska 9,500 yrs. B.P. and spread to Cook Inlet by 8,000 yrs. B.P. and to western Alaska by 5,500 yrs. B.P.

Location: AEU SCI QE 993.2 P773, AEA PMA/ASA 561.13 P763
Area: Alaska, Eastern Beringia
Topics: Beringian vegetation, Palynological sites - Eastern Beringia, Review of pollen analyses - Eastern Beringia, Review of vegetation history - Eastern Beringia, Vegetation history - *Picea*, Vegetation history - *Populus*

Ager, T. A., and M. Rubin

1984 Vegetation Changes in South-Central Alaska Since Deglaciation. In *AMQUA, 8th Biennial Meeting, Boulder, Colorado, Program and Abstracts*, p. 1.

Area: Eastern Beringia, Alaska - southern
Topics: Lake cores, Plant migration, Vegetation history - Alaska, Pollen analysis - Alaska, Vegetation history - *Populus*, Vegetation history - *Picea*

Anderson, P. M.

1982 Two Pollen Cores from the Kotzebue Sound Drainage, Northwest Alaska. In *AMQUA, 7th Biennial Meeting, Seattle, Washington, Program and Abstracts*, p. 58.

Location: AEU HSS QE 696 A5212
Area: Eastern Beringia, Alaska - northwestern
Topics: Lake cores, Palynological sites - Squirrel Lake, Palynological sites - Kaiyak Lake, Pollen analysis - Alaska, Vegetation history - Alaska

1985 Late Quaternary Vegetational Change in the Kotzebue Sound Area, Northwestern Alaska. Quaternary Research 24:307-321.

Two sediment cores from Kaiyak and Squirrel lakes in northwestern Alaska yielded pollen records that date to ca. 39,000 and 27,000 yr B.P., respectively. Between 39,000 and 14,000 yr B.P., the vegetation around these lakes was dominated by Gramineae and Cyperaceae with some *Salix* and possibly *Betula nana/glandulosa* forming a local, shrub component of the vegetation. *Betula* pollen percentages increased about 14,000 yr B.P., indicating the presence of a birch-dominated shrub tundra. *Alnus* pollen appeared at both sites between 9000 and 8000 yr B.P., and *Picea* pollen (mostly *P. mariana*) arrived at Squirrel Lake about 5000 yr B.P. The current forest-tundra mosaic around Squirrel Lake was established at this time, whereas shrub tundra existed near Kaiyak Lake throughout the Holocene. When compared to other pollen records from northwestern North America, these cores (1) represent a meadow component of lowland, Beringian tundra between 39,000 and 14,000 yr B.P., (2) demonstrate an early Holocene arrival of *Alnus* in northwestern Alaska that predates most other *Alnus* horizons in northern Alaska or northwestern Canada, and (3) show an east-to-west migration of *Picea* across northern Alaska from 9000 to 5000 yr B.P.

Location: AEU SCI QE 696 Q24
Area: Eastern Beringia, Alaska - northwestern
Topics: Dating - analysis of radiocarbon dates, Vegetation history - *Alnus*, Vegetation history - *Picea*, Palynological sites - Kaiyak Lake, Palynological sites - Squirrel Lake, Lake cores, Sea level changes, Pollen analysis - Alaska, Vegetation history - Alaska, Beringian vegetation

1988 Late Quaternary Pollen Records from the Kobuk and Noatak River Drainages, Northwestern Alaska. Quaternary Research 29:263-276.

Pollen diagrams from Joe and Niliq Lakes date to ca. 28,000 and 14,000 yr B.P., respectively. Mesic shrub tundra grew near Joe Lake ca. 28,000 to 26,000 yr B.P. with local *Populus* populations prior to ca. 27,000 yr B.P. Shrub communities decreased as climate changed with the onset of Itkillik II glaciation (25,000 to 11,500 yr B.P.), and graminoid-dominated tundra characterized vegetation ca. 18,500 to 13,500 yr B.P. Herb tundra was replaced by shrub *Betula* tundra near both sites ca. 13,500 yr B.P. with local expansion of *Populus* ca. 11,000 to 10,000 yr B.P. and *Alnus* ca. 9000 yr B.P. Mixed *Picea glauca/P. mariana* woodland was established near Joe Lake ca. 6000 yr B.P. These pollen records when combined with others from northern Alaska and northwestern Canada indicate (1) mesic tundra was more common in northwestern Alaska than in northeastern Alaska or northwestern Canada during the Duvanny Yar glacial interval (25,000 to 14,000 yr B.P.); (2) with deglaciation, shrub *Betula* expanded rapidly in northwestern Alaska but slowly in areas farther east; (3) an early postglacial thermal maximum occurred in northwestern Alaska but had only limited effect on vegetation; and (4) pollen patterns in northern Alaska and northwestern Canada suggest regional differences in late Quaternary climates.

Location: AEU SCI QE 696 Q24
Area: Eastern Beringia, Alaska - northwestern
Topics: Dating - analysis of radiocarbon dates, Palynological sites - Joe Lake, Palynological sites - Niliq Lake, Pollen analysis - Alaska, Vegetation history - Alaska, Climate history - Alaska, Vegetation history - *Populus*

Anderson, P. M., and L. B. Brubaker

1993 Holocene Vegetation and Climate Histories of Alaska. In *Global Climates Since the Last Glacial Maximum*, edited by H. E. Wright Jr., J. E. Kutzbach, T. Webb III, W. F. Ruddiman, F. A. Street-Perrott and P. J. Bartlein, pp. 386-400. University of Minnesota Press, Minneapolis, Minnesota.

Area: Alaska, Eastern Beringia
Topics: Review of vegetation history - Alaska, Review of pollen records - Alaska, Climate reconstruction, Pollen analysis - modern pollen spectra

Anderson, P. M., R. E. Reanier, and L. B. Brubaker

1988 Late Quaternary Vegetational History of the Black River Region in Northeastern Alaska. Canadian Journal of Earth Sciences 25:84-94.

Two pollen diagrams describe the previously unknown vegetational history of the Black River and Little Black River drainages of northeastern Alaska. Tundra grew throughout much of the region between ca. 19 800 and 15 000 years BP. Prior to 18 000 years BP, the vegetation was dominated perhaps by xeric Cyperaceae communities, but apparently between ca. 18 000 and 15 000 years BP a more diverse herb tundra characterized the vegetation. Herbaceous species continued to be important in the vegetation until ca. 9700 years BP, although *Betula nana-glandulosa* and *Salix* species became more common after 15 000 years BP. At ca. 9700 years BP a major change in the vegetation occurred with the spread of *Populus* (probably *P. balsamifera*), *B. nana—glandulosa*, and *Salix*, possibly resulting in a mosaic of shrub tundra and *Populus* gallery forest. *Picea glauca* migrated into the Black River region ca. 7500 years BP, followed by *Alnus* ca. 7200 years BP and *Picea mariana* ca. 6000 years BP.

Herb zone records from the Black River region support the hypothesis that eastern Beringian vegetation was characterized by a tundra mosaic prior to 14 000 years BP. Chronological and geographical patterns in the *Populus* subzone from eastern Beringia suggest that the expansion of *Populus* populations may not have been exclusively in response to climate change. Dates of *Picea* arrival on the western Porcupine Plateau indicate that this area probably was not an early Holocene migration route for *Picea*.

Location: AEU SCI QE 1 C212
Area: Eastern Beringia, Alaska - northeastern
Topics: Dating - analysis of radiocarbon dates, Lake cores, Pollen analysis - Alaska, Palynological sites - McFarlane Lake, Palynological sites - Tiinkdhul Lake, Vegetation history - *Populus*, Vegetation history - *Picea*

1990 A 14,000-Year Pollen Record from Sithylemenkat Lake, North-Central Alaska. Quaternary Research 33:400-404.

Pollen analysis of a 14,000-yr-old sediment core from Sithylemenkat Lake provides the first Holocene vegetational history for the Kanuti Flats of north-central Alaska. Basal samples contain a curious and unusual combination of tundra and boreal taxa. Pollen assemblages dating from 13,500 to 9000 yr B.P. are more typical of southern Brooks Range sites and indicate the presence of *Betula* shrub tundra with increased *Populus* ca. 10,000 to 9000 yr B.P. *Picea glauca* appeared ca. 9000 yr B.P. and *Alnus* ca. 8000 yr B.P. *P. glauca* populations declined between 7800 and 5000 yr B.P. with a subsequent reforestation by *P. mariana* and *P. glauca*. This pattern is seen at other sites in northeastern Alaska and suggests that the Holocene history of boreal forest is more complex that thought previously.

Location: AEU SCI QE 696 Q24
Area: Eastern Beringia, Alaska - central
Topics: Lake cores, Palynological sites - Sithylemenkat Lake, Pollen analysis - Alaska, Vegetation history - Alaska, Vegetation history - *Populus*

Ashworth, A. C., and D. P. Schwert

1986 The Effect of Late Wisconsinan Extinction on the Postglacial Development of the Northern North American Beetle Fauna. In *AMQUA, 9th Biennial Meeting, Champaign, Illinois, Program and Abstracts*, pp. 46-48.

Location: AEU HSS QE 696 A5212
Area: Alaska, Eastern Beringia
Topics: Insect macrofossils - beetles, Climate history, Zoogeography - beetles, Refugia

Barry, R. G.

1983 Late-Pleistocene Climatology. In *Late-Quaternary Environments of the United States Volume 1 The Late Pleistocene*, edited by S. C. Porter, pp. 390-407. University of Minnesota Press, Minneapolis, Minnesota.

Notes: H. E. Wright Jr. (series ed.).
Location: AEU SCI QE 696 L35
Area: Canada - western, Alaska, Eastern Beringia
Topics: Review of climate history - Eastern Beringia, Pollen records, Climate reconstruction

Bartlein, P. J., P. M. Anderson, M. E. Edwards, and P. F. McDowell

1991 A Framework for Interpreting Paleoclimatic Variations in Eastern Beringia. Quaternary International 10-12:73-83.

Paleoclimatic variations in a particular region can be viewed as the outcome of the superimposition of the effects of a number of large-scale controls. A framework for understanding paleoclimatic variations in a region can be established by considering the long-term history of those controls jointly with climatic modeling results that illustrate how regional climates respond to changes of individual controls.

The relevant controls of Late-Quaternary paleoclimatic variations in eastern Beringia include: (l) the size of the ice sheet, which influences both atmospheric circulation and temperature, (2) insolation, which influences mainly temperature and seasonality, (3) carbon dioxide concentration in the atmosphere, which influences temperature, and (4) feedbacks involving sea ice, sea-surface temperatures and snow cover, which reinforce the insolation effects. We review the results of a number of 'paleoclimatic experiments' with general circulation models to illustrate the potential response of eastern Beringia to the variations of these controls.

We then present a framework for understanding paleoclimatic variations in eastern Beringia by describing the likely responses of the climate of this region to the known variations in the controls. In addition, we discuss key times during the Quaternary when particular combinations of the controls give rise to 'natural experiments' which lend themselves to the testing of particular hypotheses. Our understanding of the nature of climatic variations at high latitudes should increase through examination of paleoclimatic evidence that documents the response of the region at those key times.

Location: AEU SCI QE 696 Q229
Area: Eastern Beringia
Topics: Climate reconstruction, Climate modelling, Stable isotopes - $\delta^{18}O$, Ocean cores, Sea level changes, Climate history - Eastern Beringia

Bombin, M.

1980 The Principles of Phytolith Analysis and Late Quaternary Phytoliths from Eastern Beringia. In *5th International Palynological Conference, Cambridge, England, Abstracts*, p. 49.

Area: Eastern Beringia, Yukon, Alaska
Topics: Beringian ecology, Phytoliths

1984 *On Phytoliths, Late Quaternary Ecology of Beringia, and Information Evolutionary Theory.* Unpublished Ph.D. dissertation. Department of Anthropology, University of Alberta, Edmonton, Alberta. xi + 164 pages.

The history and state of the art of phytolith analysis is critically reviewed. New techniques for collection of samples, processing, mounting, and optical and SEM microscopic analyses are presented. An innovative approach to grass and sedge phytolith taxonomy is proposed within an ontogenic and anatomical framework. Applications and avenues for phytolith research are indicated.

Conflicting hypotheses about the Quaternary (Pleistocene-Holocene mesoglacial) paleobiology of Beringia are tested for the first time by phytolith analysis. It is shown that fossil phytoliths are abundant and widespread in Beringian lake sediments, muck, and coprolites. Preliminary results indicate that the physiognomy of the plant cover during the last glacial and mesoglacial (corresponding to the regional herb pollen zone), is better described by a vegetation mosaic, where

probably diverse steppes were important components. These steppes would have included graminoid elements that occur today in more southerly temperate habitats. Phytolith data confirms the carbon stable isotope indication that C_4 plants were not a feature of the herb zone steppes. Different grass-rich assemblages continued to be widespread in Alaska and the Yukon throughout the mesoglacial (at least up to about 8,000 BP). This could have important paleobiological and archaeological implications.

It is proposed, in an extended note, that under natural conditions evolution is a stochastic process that produces genetic information heterogeneity selected in hierarchical sets of higher internal information redundancy. Therefore, selection would be a result, and not a cause of evolution. It is also suggested that the fundamental mechanism of evolution is the change in transition information (transition probabilities) of ontogenic chains. If transition probabilities change along ontogenic epigenetic chains, evolution will be translated into topological transformations of the descendents [sic]. If information is added or subtracted along the chains, or splitted [sic] (change in number of possible transitions at any state of the chain), it will be translated into topological jumps. In each of the two cases there is a change in one of the two constants of the capacity of information equation (allometric equation). Cultural evolution, being a different process, cannot be equated to biological evolution. A variety of new and reinterpreted concepts is also presented in the same note, to serve as a framework for evolutionary theory, particularly on: information theory, mind, culture, and niche. In another extended note, the subject of megafaunal extinctions in the New World is reinterpreted, an [sic] it is concluded that this episode is better modeled by a combination of interrelated feedback processes, in which anthropogenic effects are prominent.

Location: AEU SP COLL 84F-6D
Area: Eastern Beringia, Yukon - northern
Topics: Phytoliths, Vegetation history - Eastern Beringia

Bombin, M., and C. Schweger

1978 Silicophytoliths as Paleoecological Indicators to the Reconstruction of the Late Pleistocene Steppe-Tundra of the Yukon Territory, Canada. In *AMQUA, 5th Biennial Meeting, Edmonton, Alberta, Abstracts*, p. 187.

Location: AEU HSS QE 696 A5212
Area: Yukon, Eastern Beringia
Topics: Phytoliths, Beringian vegetation

Brubaker, L. B., H. L. Garfinkel, and M. E. Edwards

1982 A New Look at Vegetation Change in the Central Brooks Range, Alaska. In *AMQUA, 7th Biennial Meeting, Seattle, Washington, Program and Abstracts*, p. 77.

Location: AEU HSS QE 696 A5212
Area: Eastern Beringia, Alaska - northern
Topics: Lake cores, Pollen analysis - Alaska, Vegetation history - Alaska

1983 A Late Wisconsin and Holocene Vegetation History from the Central Brooks Range: Implications for Alaskan Palaeoecology. Quaternary Research 20:194-214.

Five pollen diagrams reveal late Wisconsin and Holocene vegetation changes in the Walker Lake/Alatna Valley region of the central Brooks Range, approximately 100 km west of the area studied by D. A. Livingstone (1955, *Ecology* **36**, 587-600). New insights into the vegetation history of this region are provided by calculations of pollen influx and by the use of linear discriminant analysis to separate *Picea glauca* and *P. mariana* pollen. Three major pollen zones are identified: (1) a basal herb zone, characterized by high percentages of Cyperaceae, Gramineae, *Salix*, and *Artemisia*, and low total pollen influx; (2) a shrub *Betula* zone with increased total pollen influx and very high percentages of *Betula* pollen, predominantly in the size range of *B. nana* and *B. glandulosa*; and (3) an *Alnus* zone dominated by *Alnus* pollen. Lakes currently within the boreal forest or near tree line show relatively high percentages of *Picea* pollen in the *Alnus* zone. Several striking vegetation changes occurred between ca. 10,000 and 7000 yr B.P. Between ca. 11,000 and 10,000 yr B.P., *Populus balsamifera* pollen percentages as great as 30% indicate that this species was present at low-

elevation sites near Walker Lake. These populations declined abruptly ca. 10,000 yr ago and have never regained prominence. About 8500 yr B.P., *Picea glauca* pollen reached 10-15%, indicating the arrival of *P. glauca* in or near the study area. *P. glauca* populations evidently decreased ca. 8000 yr ago, when *Picea* pollen percentages and influx fell to low values. About 7000 yr B.P., *Alnus* pollen percentages and influx rose sharply as alder shrubs became established widely. *Picea* once more expanded ca. 5000 yr ago, but these populations were dominated by *P. mariana* rather than *P. glauca*, which increased slowly at this time and may still be advancing northward. Some vegetation changes have been remarkably synchronous over wide areas of interior Alaska, and probably reflect responses of *in situ* vegetation to environmental changes, but others may reflect the lagged responses of species migrating into new areas.

Location: AEU SCI QE 696 Q24
Area: Eastern Beringia, Alaska - northern
Topics: Dating - analysis of radiocarbon dates, Lake cores, Palynological sites - Ruppert Lake, Palynological sites - Angal Lake, Palynological sites - Ranger Lake, Palynological sites - Headwaters Lake, Palynological sites - Redondo Lake, Pollen analysis - Alaska, Review of vegetation history - Alaska, Vegetation history - *Picea*, Vegetation history - *Populus*

Carter, L. D., and T. A. Ager
1989 Late Pleistocene Spruce (*Picea*) in Northern Interior Basins of Alaska and the Yukon: Evidence from Marine Deposits in Northern Alaska. In *Late Cenozoic History of the Interior Basins of Alaska and the Yukon*, edited by L. D. Carter, T. D. Hamilton and J. P. Galloway, pp. 11-14. Circular 1026. United States Geological Survey.

Location: AEU SCI QE 75 C57
Area: Eastern Beringia, Alaska - northeastern, Yukon - northern
Topics: Dating - amino acid, Pollen analysis, Vegetation history - *Picea*, Sea level changes, Plant macrofossils - *Picea*, Pollen records, Dating - TL, Climate history

Carter, L. D., R. M. Forester, and R. E. Nelson
1984 Mid Wisconsin Through Early Holocene Changes in Seasonal Climate in Northern Alaska. In *AMQUA, 8th Biennial Meeting, Boulder, Colorado, Program and Abstracts*, pp. 20-22.

Area: Eastern Beringia, Alaska - northern
Topics: Aeolian deposits, Dating - TL, Climate history - Alaska, Palaeosols, Periglacial features - fossil ice wedges, Plant macrofossils - wood, Insect macrofossils - beetles, Pollen analysis - Alaska, Palaeowinds, Loess, Faunal remains - Alaska, Ostracodes

Chaney, R. W., and H. L. Mason
1936 A Pleistocene Flora from Fairbanks, Alaska. American Museum Novitates. Number 887. 17 pp.

Notes: Paper contains excellent illustrations and photos of plant macrofossils.
Location: AEU SCI QH 1 A512
Area: Eastern Beringia, Alaska - central
Topics: Faunal remains - Alaska, Plant macrofossils - *Picea* seed, Plant macrofossils - *Picea* cones, Plant macrofossils - *Salix* leaves, Plant macrofossils - *Betula* leaves, Plant macrofossils - *Populus*, Plant macrofossils - seeds

Clarke, A. H., and C. R. Harington
1978 Asian Freshwater Mollusks from Pleistocene Deposits in the Old Crow Basin, Yukon Territory. Canadian Journal of Earth Sciences 15:45-51.

Approximately 15 species of terrestrial and freshwater mollusks are reported from Pleistocene deposits in the unglaciated Old Crow Basin of the northern Yukon Territory. Of those species, *Bulimus leachi* (Sheppard), a widespread Eurasian species; and *Valvata piligera yukonensis* (n. ssp.), closely related to an unusual *Valvata* now confined to Lake Baikal, U.S.S.R., are recorded from North America for the first time. Possible causes for the failure of these species of freshwater mollusks to become established in North America are considered.

Location: AEU SCI QE 1 C212
Area: Yukon - northern, Eastern Beringia
Topics: Palaeontological sites - Old Crow, Zoogeography - molluscs, Genetics - molluscs, Molluscs - freshwater, Mollusc migration, Plant macrofossils - wood

Colinvaux, P. A.

1964 The Environment of the Bering Land Bridge. Ecological Monographs 34:297-329.

A land connection between Asia and America is thought to have existed during Pleistocene glaciations and to have served as a migration route for animals and men. Lakes on land remnants of the submerged platform should contain microfossil evidence of the land bridge environment in their sediments. Sediments from two lakes and the sea bottom have been investigated.

A series of sand layers in the Imuruk Lake core are considered to record periods of low lake level. A pollen diagram of the Imuruk Lake sediments is described. It is considered to record only tundra vegetations but indicate that the climate in the region was twice colder than now. A chronology is established by means of radiocarbon dating although conflicting dates give cause for concern. The radiocarbon dating leads to the conclusion that the pollen diagram spans two glaciations and that these were recorded in the pollen diagrams as cold periods. The glaciations are further correlated with the Nome River and Salmon Lake glaciations. If the correlations are correct the record strongly suggests that the Arctic Ocean was frozen over during times of continental glaciation.

A system of terraces at Imuruk Lake, and the results of pollen analysis, are described. Carbon dating correlates the pollen zones with others from the lake core, supports the correlation of the lake diagram, and shows the terrace system to have been formed in the early postglacial period. Analysis of the lake core for animal microfossils is discussed.

A history of Imuruk Lake is constructed from the analyses. This shows the lake as having been formed in the Yarmouth interglacial and to have been in continuous existence, though with many changes of level, until the present. The history spans two periods when the Bering land bridge was in existence. It indicates that the land bridge supported only arctic tundra.

Pollen analysis of a submarine core from Kotzebue Sound is discussed. The pollen diagram is considered to record the vegetation in the drainage basin of an old river system, which deposited the sediments during the time when the last causeway between the continents was being severed. The record supports the conclusion that the land bridge supported only arctic tundra. Further support for this conclusion is found from consideration of sediments from St. Lawrence Island.

It is concluded that the Bering land bridge had an arctic climate. All animals which crossed must have been cold-adapted. Aboriginal men dwelling there must have possessed skills and cultures suited to a cold arctic life.

Notes: Summary used as abstract.
Location: AEU SCI QH 540 E28
Area: Eastern Beringia, Alaska - western
Topics: Lake cores, Palynological sites - Kotzebue Sound, Beringian land bridge connection, Palynological sites - Imuruk Lake, Pollen analysis - Arctic margin, Vegetation history - Arctic margin, Plant macrofossils - bryophytes, Climate history - Arctic margin, Glacial history - Arctic margin, Plant macrofossils - twigs, Insect macrofossils, Sea level changes, Ocean cores, Human migration

1967 Quaternary Vegetational History of Arctic Alaska. In *The Bering Land Bridge*, edited by D. M. Hopkins, pp. 207-231. Stanford University Press, Stanford, California.

The pollen record suggests that the Bering Strait region has never supported forest, from some time in the interglacial interval that preceded the Illinoian Glaciation until the present. During glacial periods, the tree line receded far to the west and south of its present position. ...

By the time of the Wisconsin maximum, trees had again retreated far to the east of Seward Peninsula, and dwarf birches had become rare. There was an herbaceous tundra like that of modern Barrow; however, it may have had some of the steppe characteristics of Illinoian times. At Barrow itself, a tundra even more arctic than that of the present is indicated. There were probably no dwarf birches or alder bushes north of the Brooks Range.

From late Wisconsin time to the present, pollen diagrams from many parts of arctic Alaska record parallel developments of vegetation. In glacial times, spruce, alder, and dwarf birch were all far to the south or east of their present limits. At each site, the vegetation was comparable to that now found several hundred kilometers farther north. With the end of the Wisconsin Glaciation, there was an advance of trees and shrubs, with dwarf birches always well in front of the alder and spruce lines. This advance was completed some 10,000 years ago on the Seward Peninsula, when the tree line had reached or slightly surpassed its present limits. The rise of the sea to within a few meters of its present level then brought a maritime climate to what is now the Alaskan coastal strip, and local adjustments were made to the tree line, which brought it back to about its present position. In mountainous regions, the development of modern vegetation was delayed by the presence of mountain glaciers. There were local small advances of alder during the hypsithermal period. ...

Notes: Based on a Symposium held at the VII Congress of the International Association for Quaternary Research (INQUA), Boulder, Colorado, 1965. Conclusion abbreviated for abstract.
Location: AEU SCI QE 39 H79
Area: Eastern Beringia, Alaska, St. Lawrence Island, Pribilof Islands
Topics: Review of pollen studies - Alaska, Pollen analysis - Alaska, Palynological sites - Chandler Lake, Palynological sites - Ogotoruk Creek, Palynological sites - Nome, Palynological sites - Imuruk Lake, Palynological sites - Kotzebue Sound, Palynological sites - Cagaloq Lake (formerly Lake Hill Lake), Palynological sites - Flora Lake, Treeline fluctuations - arctic, Plant macrofossils - wood

1980 Quaternary Vegetation History of Arctic Regions - Alaska. In *5th International Palynological Conference, Cambridge, England, Abstracts*, p. 89.

Area: Eastern Beringia, Alaska, Bering-Chukchi platform, Yukon - western
Topics: Pollen records - Arctic margin, Beringian vegetation, Climate history - Arctic margin, Vegetation history - Arctic margin

Connor, C. L.

1982 Pollen Evidence for a Mid-Wisconsin Interstadial Event in South Central Alaskan Glacio-Lacustrine Sediments. In *AMQUA, 7th Biennial Meeting, Seattle, Washington, Program and Abstracts*, p. 84.

Area: Eastern Beringia, Alaska - southern
Topics: Glacial lake sequences, Glacial history - Alaska, Stratigraphy, Vegetation history - Alaska, Pollen analysis - Alaska

Cwynar, L.

1978 A Late-Quaternary Pollen Diagram from Unglaciated Northern Yukon. In *AMQUA, 5th Biennial Meeting, Edmonton, Alberta, Abstracts*, p. 162.

Location: AEU HSS QE 696 A5212
Area: Yukon - northern, Eastern Beringia
Topics: Palynological sites - Hanging Lake, Pollen analysis - Yukon, Glacial lake sequences, Vegetation history - Yukon

Cwynar, L. C.

1980 The Nature of Arctic Steppe-Tundra in the Northern Yukon. In *5th International Palynological Conference, Cambridge, England, Abstracts*, p. 100.

Area: Eastern Beringia, Yukon - northern
Topics: Palynological sites - Hanging Lake, Pollen analysis - Yukon, Beringian vegetation

1982 A Late-Quaternary Vegetation History from Hanging Lake, Northern Yukon. Ecological Monographs 52:1-24.

A 403-cm core was recovered from Hanging Lake in unglaciated northern Yukon. Twenty-one radiocarbon dates indicate that the section is at least 25 000 and possibly 33 000 yr old; they permit the calculation of pollen influxes for the full-glacial in eastern Beringia. Numerical methods were used to divide the pollen stratigraphy into five zones. From prior to 33 000 to 18 450 BP, a herb zone was dominant (zone HL 1) with high percentages of Gramineae, *Artemisia*, and Cruciferae. However, the low pollen influx, ranging from 5-100 grains • cm^{-2} • yr^{-1}, the low organic content of the sediment, and the occurrence of open-ground taxa all indicate that the vegetation cover was sparser than it is today. The arctic-alpine affinities of the herb pollen show that generically the vegetation was akin to modern arctic plant communities. Modern fellfield communities in the northern Yukon and Siberia have a rich and endemic *Artemisia* flora and they can produce pollen spectra comparable to that of the herb zone. Percent and influx values for spruce, alder, and birch increased slightly during subzone H 1B (21 680-18 450 BP); this subzone probably represents an interstadial. From 18 450 to 14 600 BP, a *Salix*-Cyperaceae zone (HL 2) occurred, suggesting the development of snowbed and willow scrub communities in sheltered areas. Between 14 600 and 11 100 BP *Betula* pollen dominated (zone HL 3) indicating the spread of dwarf birches, but the influx data show that this initial increase was modest compared with the subsequent zone and thus dwarf birches were probably restricted at this time to more favorable habitats. The spread of birch together with the increased total pollen influx, the higher organic content of the sediment, and the increased richness of herb pollen indicates that the local flora was more diverse and that the vegetative cover increased. The climate must have warmed. Zone HL 4 (Ericales zone) spanned the period from 11 100 to 8900 BP. Wet heath communities became locally abundant, poplar was more abundant at the beginning of this zone than at any subsequent time, the ranges of *Typha latifolia* and *Myrica gale* were greater than today, and pollen influx and sedimentation rate both increased greatly. Spruce became regionally abundant. These varied changes are probably in response to a warmer and wetter climate; they provide evidence for a late Pleistocene to early Holocene warm interval initially recognized by McCulloch and Hopkins (1966). Zone HL 5 (*Alnus crispa* zone) has been dated from 8900 BP to the present; it reflects the regional expansion of *Alnus crispa* on organic soils.

Location: AEU SCI QH 540 E28
Area: Yukon - northern, Eastern Beringia
Topics: Dating - analysis of radiocarbon dates, Lake cores, Palynological sites - Hanging Lake, Pollen analysis - Yukon, Pollen analysis - numerical zonation, Vegetation history - Yukon

1988 Late Quaternary Vegetation History of Kettlehole Pond, Southwestern Yukon. Canadian Journal of Forest Research 18:1270-1279.

A pollen diagram with a detailed chronology reveals Late-Pleistocene and Holocene vegetation changes which, in combination with previously published data, provide information on regional vegetation changes in the western boreal forest of the southwestern Yukon. A *Populus* woodland with an understory of *Shepherdia canadensis* and extensive open areas dominated by *Artemisia* occurred from 11 030 to 9250 BP. *Juniperus* populations expanded at 9700 BP and then more-mesic forest communities developed when *Picea glauca* populations increased at 9250 BP and *Populus* declined. At 6100 BP there is a remarkable shift from *Picea glauca* woodland with *Juniperus* to a mixed spruce forest in which *P. mariana* was the dominant species. At 4100 BP conditions altered to favour *P. glauca* which expanded at the expense of *P. mariana*, and *Juniperus* again became important in the vegetation. By 1900 BP *Pinus contorta* had become a dominant tree as *P. mariana* declined, the latter eventually disappearing from the local vegetation. There is no evidence that grasslands were more extensive in the early Holocene, as has been hypothesized for the southwestern Yukon. The vegetation sequence implies an initial period of aridity from 11 030 to 9250 BP, when summer warmth was probably greater than that of the modern climate, a period of increased effective moisture between 9250 and 6100 BP, when *Picea glauca* was abundant, even greater effective moisture between 6100 and 4100 BP, when *Picea mariana* was the dominant forest tree, and then a prolonged period of increasing aridity beginning at 4100 BP and culminating in the development of the modern semi-arid climate.

Location: AEU SCI SD 145 C23
Area: Eastern Beringia, Yukon - southern
Topics: Pollen analysis - Yukon, Lake cores, Vegetation history - Yukon, Palynological sites - Kettlehole Pond, Vegetation history - *Picea*, Climate history - Yukon, Tephra - White River

Cwynar, L. C., and J. C. Ritchie
1980 Arctic Steppe-Tundra: A Yukon Perspective. Science 208:1375-1377.

The first reliable, securely dated full- and late-glacial pollen stratigraphy from Eastern Beringia forces the rejection of the widely held hypothesis of a steppe-tundra or grassland associated with extinct vertebrates and early humans. The arctic-alpine fossil flora and low pollen influx suggest a sparse tundra similar to modern herb fell-field vegetation.

Location: AEU SCI Q 1 S41
Area: Eastern Beringia, Yukon - northern
Topics: Lake cores, Beringian vegetation, Pollen analysis - Yukon, Vegetation history - Yukon, Palynological sites - Hanging Lake, Palynological sites - Lateral Pond

Davis, O. K., and W. D. Sellers
1987 Contrasting Climatic Histories for Western North America During the Early Holocene. Current Research in the Pleistocene 4:87-89.

Location: AEA PMA/ASA
Area: Washington - western, Eastern Beringia
Topics: Climate history

Edwards, M. E., P. M. Anderson, H. L. Garfinkel, and L. B. Brubaker
1985 Late Wisconsin and Holocene Vegetational History of the Upper Koyukuk Region, Brooks Range, AK. Canadian Journal of Botany 63:616-626.

Three pollen diagrams provide information on late Wisconsin and Holocene vegetation history at high elevation and midelevations (1000 and 600 m) in the east-central Brooks Range. After the retreat of glacial ice and until about 12 000 years before present, the vegetation was a tundra, dominated by *Salix*, Cyperaceae, Gramineae, *Artemisia*, and other herbaceous taxa. However, because the early pollen spectra do not have close modern analogs, the detailed composition and ecology of this tundra cannot be inferred. Between ca. 12 000 and ca. 8 000 years before present, *Betula nana-glandulosa* was the dominant pollen producer at both elevations; a significant ericaceous component was present in the vegetation of the alpine sites, but not at the lower elevation site. During the period 10 500 - 8 500 years before present, *Populus balsamifera* and *Juniperus* were probably abundant at the lower site and may also have been present at the higher sites, where they are now absent. *Picea glauca*, *Alnus* spp., *Picea mariana*, and *Betula papyrifera* became established at the lower site between ca. 8500 and 6000 years before present. None of these species currently grows at the high sites, but their arrival at lower elevations is represented in the regional pollen rain at these sites. The arrival times of *Picea glauca* and *Picea mariana* in the study area are consistent with the hypothesis that *P. glauca* preceded *P. mariana* into the central Brooks Range.

Location: AEU SCI QK 1 C21
Area: Eastern Beringia, Alaska - northern
Topics: Dating - analysis of radiocarbon dates, Lake cores, Palynological sites - Screaming Yellowlegs Pond, Palynological sites - Rebel Lake, Palynological sites - Redstone Lake, Vegetation history - Alaska, Vegetation history - *Picea*, Vegetation history - *Populus*, Pollen analysis - Alaska

Edwards, M. E., and L. B. Brubaker
1984 A 23,000 Year Pollen Record from Northern Interior Alaska. In *AMQUA, 8th Biennial Meeting, Boulder, Colorado, Program and Abstracts*, p. 35.

Area: Eastern Beringia, Alaska - northeastern
Topics: Loess, Plant macrofossils - *Salix*, Pollen analysis - Alaska, Vegetation history - Alaska

1986 Late Quaternary Vegetation History of the Fishhook Bend Area, Porcupine River, Alaska. Canadian Journal of Earth Sciences 23:1765-1773.

Ped Pond is a lake lying in a Pleistocene scour channel of the Porcupine valley. The valley is considered to be a possible path of late Quaternary species migrations between interior Alaska and northwest Canada. Pollen in the oldest lake sediments (ca. 13 000 years old) indicates that shrub birch and willow probably occurred locally in a sparsely vegetated, herb-dominated landscape. *Populus*, *Juniperus*, and *Typha latifolia* increased about 10 000 years ago, suggesting particularly warm temperatures during the early Holocene. *Picea glauca*, which is presently common in the surrounding forests, first arrived near Ped Pond about 8500 years ago. This arrival date, together with existing evidence from other sites, indicates that spruce expanded rapidly across far-eastern Beringia 8000-9000 years ago. Other boreal forest taxa, *Picea mariana*, *Betula papyrifera*, and *Alnus* spp., became established locally between 7000 and 8000 years BP. A date of ca. 7500 years BP at Ped Pond suggests that the *Alnus* rise in northeast Alaska preceded that in adjacent Canada, possibly reflecting an eastward movement of alder. The vegetation history at Ped Pond suggests the Porcupine valley has been an important transition zone throughout the Holocene; some events are characteristic of northern Alaska and some of northwest Canada.

Location: AEU SCI QE 1 C212
Area: Eastern Beringia, Alaska - northeastern
Topics: Lake cores, Palynological sites - Ped Pond, Vegetation history - *Alnus*, Vegetation history - *Picea*, Plant migration, Pollen analysis - Alaska, Vegetation history - Alaska, Vegetation history - *Populus*

Edwards, M. E., and P. F. McDowell

1984 Quaternary Environmental History in the Southern Yukon Lowland, N.E. Interior Alaska. In *6th International Palynological Conference, Calgary, Abstracts*, p. 40.

Area: Eastern Beringia, Alaska - northeastern
Topics: Palynological sites - Sands of Time Lake, Palynological sites - Birch Creek, Loess, Vegetation history - Alaska, Tephra - Old Crow, Pollen analysis - Alaska, Plant macrofossils - wood

1991 Interglacial Deposits at Birch Creek, Northeast Interior Alaska. Quaternary Research 35:41-52.

A 12-m sequence of lake sediment and peat in a 45-m high exposure on Birch Creek, northeast Alaska, contains pollen of *Picea*, *Betula*, *Alnus*, and *Populus*, and wood of *Picea* and *Populus*. This sequence, which may represent 10,000 yr of [sic] more of accumulation, is beyond the limit of radiocarbon dating. It lies between two units of loess; the underlying loess lies above the Old Crow Tephra, recently dated at 149,000 $\pm$ 13,000 yr B.P. The lake sediments probably were deposited during the last interglaciation (isotope substage 5e) and subsequently buried by Wisconsin loess. Analogs for the ancient lake may be deep, long-lived thaw lakes that are present in the modern landscape. When Birch Creek is correlated with other sites across nonglaciated Alaska and northwest Canada, there appears to be a common interglacial signal in sediments overlying the Old Crow Tephra.

Location: AEU SCI QE 696 Q24
Area: Eastern Beringia, Alaska - northeastern
Topics: Lake cores, Molluscs, Periglacial features - thermokarst, Palynological sites - Birch Creek, Pollen analysis - Alaska, Vegetation history - Alaska, Loess, Tephra - Old Crow, Vegetation history - *Picea*, Plant macrofossils - *Picea*, Plant macrofossils - *Populus*, Plant macrofossils - peat, Stratigraphy

Eisner, W. R., and P. A. Colinvaux

1990 A Long Pollen Record from Ahaliorak Lake, Arctic Alaska. Review of Palaeobotany and Palynology 63:35-52.

The pollen analysis of the top three meters of sediments in Ahaliorak Lake from north of the Brooks Range in arctic Alaska spans from the present to before 30,000 years ago, revealing the history of climate since early in the Boutellier interstade. Comparison with other data show that the record represents the history of regional climate. Climate of the Boutellier interstade was perhaps as warm as some Holocene climates but was significantly drier. Moisture early in the last glaciation suggests partial flooding of the Bering-Chukchi platform. Climate of the glacial maximum was cold and dry until the waning phase of the glaciation when increasing moisture is apparent. The time of the late glacial birch rise was a period of exceptional warmth at Ahaliorak Lake, which then supported a community of *Myriophyllum*. The vegetation of the Bering land bridge north of the Brooks Range was not a polar desert but neither was it steppe, rather it was poorly productive, dry tundra.

Location: AEU SCI QE 901 R45
Area: Eastern Beringia, Alaska - northern
Topics: Palynological sites - Ahaliorak Lake, Lake cores, Pollen analysis - Alaska, Beringian vegetation, Vegetation history - Alaska, Climate history - Alaska

Elias, S. A., and S. K. Short
1992 Paleoecology of an Interglacial Peat Deposit, Nuyakuk, Southwestern Alaska, U.S.A. Géographie physique et Quaternaire **46:85-96.**

This paper reports the presence of interglacial beetle and pollen assemblages within a Pleistocene peat deposit exposed along the Nuyakuk River of southwestern Alaska. The fossil beetle assemblages contain a number of species not previously identified from eastern Beringian fossil assemblages. The Nuyakuk interglacial deposits are exposed within a 6-m-high terrace along the river, about 4 km beyond the moraine of the penultimate glaciation. Interglacial peat lies within the lowermost meter of the bluff and is overlain by fluvial gravel and loess. Insect fossils were extracted from five peat samples, yielding sixty-seven identified beetle taxa. The insect faunal diversity of the Nuyakuk assemblages is comparable to that found in regional Holocene peat samples. In contrast to assemblages of similar age from interior eastern Beringia, the Nuyakuk fauna contains significant numbers of aquatic, hygrophilous and riparian taxa. Four pollen samples from the Nuyakuk site were analyzed, providing spectra dominated by a few taxa, notably *Alnus*, *Betula*, *Picea*, Gramineae, Cyperaceae, Filicales, and *Sphagnum*, suggesting a rich alder-birch shrub tundra not much different from the modern regional vegetation. The pollen and insect fossil records also suggest climatic conditions similar to modern.

Location: AEU SCI G 1 R452
Area: Eastern Beringia, Alaska - southwestern
Topics: Pollen analysis - modern pollen spectra, Palynological sites - Nuyakuk Lake, Pollen analysis - Alaska, Insect macrofossils - beetles, Climate history, Vegetation history - Alaska, Zoogeography - insects

Elias, S. A., S. K. Short, and P. Lea
1986 Late-Quaternary Paleoenvironments at Flounder Flat, Nushagak Lowland, SW Alaska. In *AMQUA, 9th Biennial Meeting, Champaign, Illinois, Program and Abstracts*, p. 132.

Location: AEU HSS QE 696 A5212
Area: Eastern Beringia, Alaska - southwestern
Topics: Insect macrofossils - beetles, Periglacial features, Loess, Aeolian deposits, Plant macrofossils - peat, Pollen analysis - Alaska, Climate history - Alaska, Vegetation history - Alaska

Hamilton, T. D.
1976 Camp Century δ [sic] Record vs. Dated Climatic Records from Alaska and Siberia. In *AMQUA, 4th Biennial Meeting, Tempe, Arizona, Abstracts*, pp. 22-24.

Area: Eastern Beringia, Alaska - northern, Alaska - central, Siberia, Western Beringia
Topics: Periglacial features, Stable isotopes - $\delta^{18}O$, Plant macrofossils - wood, Plant macrofossils - peat, Climate history, Glacial history, Glacial geomorphology, Vegetation history

Harington, C. R.

1985 Annotated Bibliography of Quaternary Climatic Change in Canada, and a Brief Analysis of its Contents. In *Climatic Change in Canada 5: Critical Periods in the Quaternary Climatic History of Northern North America*, edited by C. Harington, pp. 53-62. Syllogeus No. 55. National Museums of Canada, Ottawa, Ontario.

Location: AEU SCI QH 1 S985
Area: Canada
Topics: Climate history, Bibliography - Quaternary climatic change

Heusser, C. J.

1983 Vegetational History of the Northwestern United States Including Alaska. In *Late-Quaternary Environments of the United States Volume 1 The Late Pleistocene*, edited by S. C. Porter, pp. 239–258. University of Minnesota Press, Minneapolis, Minnesota.

Notes: H. E. Wright Jr. (series ed.).
Location: AEU SCI QE 696 L35
Area: Washington - western, Alaska, Eastern Beringia
Topics: Review of vegetation history - Eastern Beringia, Review of pollen studies - Eastern Beringia

Hopkins, D. M.

1970 Paleoclimatic Speculations Suggested by New Data of the Location of the Spruce Refugium in Alaska During the Last Glaciation. In *AMQUA, 1st Biennial Meeting, Abstracts*, p. 67.

Location: AEU HSS QE 696 A52
Area: Eastern Beringia, Alaska - western, Alaska - central
Topics: Refugia, Plant migration, Sea level changes, Aeolian deposits, Geomorphology - dunes, Periglacial features, Vegetation history - *Picea*, Palaeowinds, Climate history - Alaska

Hu, F. S., L. B. Brubaker, and P. M. Anderson

1993 A 12 000 Year Record of Vegetation Change and Soil Development from Wien Lake, Central Alaska. Canadian Journal of Botany 71:1133-1142.

Pollen, plant-macrofossil, macroscopic-charcoal, and geochemical analyses of a sediment core from Wien Lake provide new information on the late Quaternary environmental history of central Alaska. Shrub tundra dominated by *Betula glandulosa* occupied the area 12 000 - 10 500 BP. Low plant cover and intensive soil erosion of the tundra landscape are indicated by low pollen-accumulation rates, high sediment inorganic content, and high allogenic elemental concentrations. Around 10 500 BP, *Populus* and *Salix* invaded the shrub tundra and open ground to form dense stands within the lake catchment. The marked increases in sediment organic content and authigenic concentrations of Fe, Mn, and Al during the period of *Populus-Salix* dominance suggest humic buildup and stabilization of the catchment soils. These soil changes in turn may have contributed to the demise of *Populus-Salix* communities 9500 BP. Fossil seeds indicate that *Betula papyrifera* arrived 9500 BP, rather than in the middle to late Holocene as suggested by previous palynological studies. *Picea glauca* codominated open woodlands with *B. papyrifera* 9500-7500 BP. The decline of *Picea glauca* 7500 BP was probably due to an episode of climatic cooling rather than autogenic processes resulting in waterlogged soils. *Alnus* arrived in the region 7500 BP. After 6500 BP, modern boreal forest dynamics are indicated by the dominance of *Picea mariana*, fluctuations of *Picea glauca*, and frequent occurrence of local fires.

Location: AEU SCI QK 1 C21
Area: Alaska - central, Eastern Beringia
Topics: Palynological sites - Wien Lake, Pollen analysis - Alaska, Plant macrofossils, Vegetation history - Alaska, Lake cores, Geochemistry, Plant macrofossils - *Betula*, Vegetation history - *Picea*, Vegetation history - *Populus*

Janssens, J. A. P.

1981 ***Subfossil Bryophytes in Eastern Beringia: Their Paleoenvironmental and Phytogeographical Significance*. Unpublished Ph.D. dissertation. Department of Botany, University of Alberta, Edmonton, Alberta. xiii + 45 pages.**

Eight hundred and eighty two new subfossil records of bryophytes are reported. The specimens were extracted from unconsolidated Pleistocene and Holocene sediments by screening. Five hundred and twenty-two of the records are from a complex sequence of Late Pleistocene age in the Old Crow Basin in the northern Yukon Territory, Canada, while other samples analysed are from Alaska, Alberta, Greenland, Iowa, Northwest Territories, Nova Scotia, Ontario and Quebec. Attention is drawn to microscopic morphological characters that differentiate the 145 different taxa. Habitat descriptions, recent North American distribution ranges and the known subfossil record in North America are compiled for each taxon.

The few liverwort records contrast sharply with the numerous mosses reported. On the other hand, the Amblystegiaceae (457 records) are strongly over-represented by comparison with the present day flora. Most extant *Drepanocladus* species have been found in samples of Late Pleistocene age (250 records). A key to identify fragmentary *Drepanocladus* material has been constructed and each species is defined by a diagnosis. A newly described species, *D. crassicostatus*, is characterized by an excurrent costa, denticulate margins and poorly developed alar cells. It is an extremely common subfossil in arctic and subarctic lacustrine and transported sediments, and is closely related to the European *D. trichophyllus*. *Drepanocladus crassicostatus* is known from only a few, scattered, present-day populations in North America, but its apparent scarcity may reflect lack of collections. It is found in highly minerotrophic waters, in contrast with the oligotrophic habitats characteristic of *D. trichophyllus*.

The preserved bryophytic remains in the Old Crow Basin sequence make it possible to aid in the reconstruction of the Late Pleistocene and postglacial vegetation history of eastern Beringia. Geomorphological evidence indicates that the basin was flooded at least twice and that these floods correlated with the major advances of Keewatin ice. During the long intervening period fluviatile sediments were deposited and in this inorganic matrix of sands, silts and clays were abundant organic remains. Most bryophytes are members of transported assemblages. However, some mixed and autochthonous samples were also recovered.

During the Gold Hill and early Old Crow Intervals (80,000 to 40,000 years ago) forests developed. This is indicated by the increase in bryophytes growing in mesic habitats. *Leptodontium flexifolium*, a possible remnant of a late Tertiary mesophytic flora, was still present during these intervals in the Old Crow Basin. This oceanic and montane species presumably became extinct north of the Southern Appalachians during the Late Wisconsinan. The formation of an extensive erosional surface, 65,000 years ago, suggests the optimal phase of the interstadial. The landscape was a mosaic of rich fen habitats, well developed *Picea* forest communities and dried upland calcareous tundra (with numerous moss taxa). *Sphagnum* was much less abundant than it was during the more mesophytic postglacial period. The later part of the Old Crow Interval (40,000 to 25,000 years ago) saw the onset of a very dry and probably cold period. Some southern Yukon moss assemblages indicate steppe-tundra vegetation. Bryophytes in the Old Crow Basin are derived exclusively from rich fen communities. *Sphagnum* is completely lacking. Also, there is no evidence of trees and shrubs. However, during the same period extensive rich bryophyte assemblages southeast of the basin in the Richardson Mountains indicate the survival of extremely diversified *Picea* forest until immediately before the appearance of Keewatin ice.

During the following Duvany Yar Interval that coincided with the last flooding of the basin in the northern Yukon, sterile clays were deposited and there is no bryophyte record in the Old Crow localities. The interval came to an abrupt end 13,000 years ago. The basin drained and extensive peat accumulations started by 9000 years ago. More mesophytic communities are suggested by the bryophyte assemblages, and *Sphagnum* became abundant for the first time.

Location: AEU SP COLL 81F-38D
Area: Eastern Beringia, Yukon - northern
Topics: Biogeography - bryophytes, Plant macrofossils - bryophytes, Vegetation history - Eastern Beringia

Lamb, H. F., and M. E. Edwards

1988 **The Arctic. In *Vegetation History*, edited by B. Huntley and T. Webb III, pp. 519-555. Handbook of Vegetation Science Volume 7. Kluwer Academic Publishers, Dordrecht, The Netherlands.**

Location: AEU SCI QK 48 H23
Area: Eastern Beringia

Topics: Treeline fluctuations - arctic, Vegetation history - *Pinus*, Vegetation history - *Alnus*, Vegetation history, Review of pollen analyses - Eastern Beringia, Beringian vegetation, Review of vegetation history - Eastern Beringia, Vegetation history - *Picea*

Lea, P. D., S. A. Elias, and S. K. Short

1991 Stratigraphy and Paleoenvironments of Pleistocene Nonglacial Deposits in the Southern Nushagak Lowland, Southwestern Alaska, U.S.A. Arctic and Alpine Research 23:375-391.

Two Pleistocene nonglacial units underlie eolian deposits of the last glaciation in the southern part of the Nushagak lowland, a major Quaternary basin in southwestern Alaska. The Flounder Flat complex, the lower of the two units, consists mainly of deposits of tundra lakes. Pollen and beetle data suggest a somewhat mesic graminoid tundra without significant birch and ericaceous shrubs and a climate colder than present. The overlying Etolin complex includes organic silt, nonwoody peat, and associated inorganic sediments that accumulated in swales and on lower slopes. Lowermost peaty silt of the Etolin complex locally contains pollen spectra indicative of birch-shrub tundra and beetle assemblages characteristic of mesic-to-wet habitats broadly similar to those of the Holocene tundra. Evidence for full-interglacial climates, however, is ambiguous. Stratigraphically higher samples from the Etolin complex suggest a colder-than-modern graminoid tundra with local mesic-to-wet habitats but restricted shrub cover. Radiocarbon and paleoecological data suggest at least partial correlation of the Etolin complex with the middle Wisconsin (Boutellier) nonglacial interval, mostly >38,000 yr B.P.

Location: AEU SCI G 1 A68
Area: Alaska - southwestern, Eastern Beringia
Topics: Periglacial features - fossil ice wedges, Palynological sites - Nushagak Bay, Tephra - Alaska, Stratigraphy, Pollen analysis - Alaska, Insect macrofossils - beetles, Plant macrofossils - peat, Vegetation history - Alaska, Climate history - Alaska

Lichti-Federovich, S.

1973 Palynology of Six Sections of Late Quaternary Sediments from the Old Crow River, Yukon Territory. Canadian Journal of Botany 51:553-564.

The Old Crow Plain, northern Yukon Territory, Canada, is a large flat lowland consisting of basin-fill sediments of Late Quaternary age. The modern Arctic treeline passes across the northern tip of the lowland, and much of the vegetation consists of tundra and shrub tundra, with scattered groves of spruce mainly on alluvial deposits. Steep scarps have been exposed by the downcutting of the Old Crow River in these basin-fill sediments, and good exposures of Late Quaternary sediments are available for investigation. Samples from six of these exposures were analyzed for pollen. Although many parts of the sections were barren, it has been possible to derive pollen diagrams with discrete pollen zones for the six sections, and four pollen assemblage types have been identified. Their occurrence in the stratigraphic sequence suggests the following pattern of pollen stratigraphy: the lowermost sedimentary units, probably deposited early in the interstadial following an Early Wisconsin glaciation, are of pollen assemblage types III (Glumiflorae-herb) or IV (*Betula*-herb), both indicative of tundra vegetation; the middle levels of the sediment show, consistently, pollen spectra of type II (*Picea-Betula*-Glumiflorae-herb), indicating forest groves with tundra, quite similar to the modern vegetation. The sediment underlying the Upper Glaciolacustrine Unit (correlative, according to Hughes (1969), with the Classical Wisconsin Stadial) yields pollen assemblage type III (Gluminiflorae-herb), which is interpreted as indicating a rich and varied tundra. These vegetation reconstructions are consonant with a tentative palaeoclimatic interpretation in terms of a tripartite interstadial climate showing severe tundra climate — milder forest or forest-tundra climate — severe tundra climate. Two of the sections have incomplete pollen stratigraphy for the uppermost postglacial silts and peats. They suggest that vegetation similar to the present day became established in the Old Crow Plain in mid-postglacial time.

Location: AEU SCI QK 1 C21
Area: Eastern Beringia, Yukon - northern
Topics: Palynological sites - Old Crow, Pollen analysis - Yukon, Stratigraphy, Vegetation history - Yukon, Plant macrofossils - peat, Plant macrofossils - *Picea*

1974 *Palynology of Two Sections of Late Quaternary Sediments from the Porcupine River, Yukon Territory.* Geological Survey Paper 74-23. Geological Survey of Canada, Ottawa, Ontario. 6 pp.

Two exposures of Quaternary sediments along the Porcupine River, northern Yukon Territory, were sampled. The upper part of the pollen and sediment stratigraphic record shows a close correlation with results from the Old Crow Flats area. Two glaciolacustrine units occur in both sections, and it is likely that the upper is correlative with the Classical Wisconsin and the lower with an older glacial stage.

The sediments underlying the Lower Glaciolacustrine Unit yield a pollen assemblage distinct from any occurring in younger strata. This assemblage is distinguished by the occurrence of pine and hazel pollen, associated with tree birch, alder and spruce. Subzones with and without hazel are recognized. The assemblage is interpreted as indicating the presence of a forest dominated by spruce and birch with some pine also present. The upper pollen zones are characterized by pollen assemblage types identical to those of the Old Crow area, which were interpreted as representing a transition from arctic tundra through boreal forest to subarctic or arctic tundra.

Location: AEU SCI QE 185 C2
Area: Eastern Beringia, Yukon - northern
Topics: Palynological sites - Porcupine River, Pollen analysis - Yukon, Stratigraphy, Vegetation history - Yukon, Plant macrofossils - peat, Plant macrofossils - wood, Plant macrofossils - *Picea* cones

Livingstone, D. A.

1955 Some Pollen Profiles from Arctic Alaska. Ecology 36:587-600.

A three-zone pollen chronology has been established for the region surrounding the central Brooks Range in northern Alaska.

The oldest of these zones, characterized by herbaceous tundra vegetation, appears to be contemporary with the Eschooka glaciation.

The youngest of these zones, characterized on the north side of the Brooks Range by tundra with shrubs and on the south side by hemiarctic vegetation, appears to include a weakly developed postglacial thermal maximum.

The longest core contains, in its herbaceous zone, evidence of a temporary climatic deterioration similar to Zone III of the European pollen chronology. The sediments in which the evidence occurs are laminated.

The NAP/AP ratio of surface samples from a number of tundra lakes is much lower than the 1:1 that is usually taken to represent the division between forest and tundra.

About 50 different pollen and spore types were identified in the material. The principal pollen types were *Betula*, *Alnus*, *Picea*, *Salix* and Cyperaceae.

Vegetational changes during the time represented by the samples studied appear to have been much less striking than those of the temperate zone during the same time. This supports the view that the arctic unglaciated areas have served as glacial-age refugia for very many of the plants living in them today.

Notes: Summary used as abstract.
Location: AEU SCI QH 540 E19
Area: Eastern Beringia, Alaska - northern
Topics: Pollen analysis - modern pollen spectra, Refugia, Palynological sites - Chandler Lake, Palynological sites - Eight Lake, Palynological sites - Lake A, Palynological sites - Death Valley Station, Lake cores, Pollen analysis - Alaska, Vegetation history - Alaska

Mathewes, R. W.

1991 Climatic Conditions in the Western and Northern Cordillera During the Last Glaciation: Paleoecological Evidence. Géographie physique et Quaternaire 45:333-339.

In the southern Cordillera, paleoecological evidence suggests that climate was variable, from cooler than present by up to 3°C, to possibly similar to modern during the Olympia non-glacial interval (>59 ?o [sic] 25-29 ka). The development of open subalpine parkland vegetation in lowlands after 25 ka reflects slow cooling to glacial conditions. Assumptions about continuously cold and dry glacial conditions are tested and disputed. Between 18-19 ka, pollen, plant macrofossil and beetle evidence suggest relatively warm and moist conditions in the Fraser/Puget Lowlands. A tentative correlation can be inferred with the recently defined "Hanging Lake thermal event" around 18-22 ka in the unglaciated

Yukon. Further work should be done to test this inference. Paleobotanical data suggest that increasing moisture, rather than increased cooling, was responsible for the last Vashon ice advance in the southwestern Cordillera. The controversy regarding the nature of the vegetation cover in eastern Beringia, north of the main Cordilleran ice sheet, is not yet settled, although evidence to date favours a complex mosaic of tundra and "steppe-tundra" plant communities supporting a greater diversity of grazing large mammals than exist in the area today.

Location: AEU SCI G 1 R452
Area: British Columbia - Queen Charlotte Islands, Eastern Beringia, British Columbia - southwestern
Topics: Climate history, Review of vegetation history - Eastern Beringia, Pollen records, Review of pollen studies - Eastern Beringia, Plant macrofossils, Plant macrofossils - wood, Insect macrofossils - beetles, Refugia, Beringian vegetation

Matthews Jr., J. V.

1968 A Paleoenvironmental Analysis of Three Late Pleistocene Coleopterous Assemblages from Fairbanks, Alaska. Quaestiones Entomologicae 4:202-224.

Fossils of beetles (Order Coleoptera) and other insects are abundant in Pleistocene silts and peats from interior Alaska. Three Wisconsin age silt samples from the Eva Creek exposure near Fairbanks, Alaska were examined for their content of fossil insects. A study of the coleopterous fauna - and primarily the carabid (ground beetle) portion of the coleopterous fauna - of each of these samples revealed that at the time of their deposition the environment of Fairbanks, Alaska was similar to alpine tundra at higher elevations or coastal tundra in other parts of the state. This conclusion concerning the paleoenvironment of lowland interior Alaska agrees with conclusions reached by the author and other workers after examination of fossil pollen spectra and fossil mammals from the Eva Creek mining cut and similar exposures near Fairbanks. Minor variations among the three coleopterous assemblages are provisionally related to local environmental differences rather than to changes of the macroclimate of interior Alaska during Wisconsin time.

Location: AEU SCI QL 461 Q2
Area: Alaska - central, Eastern Beringia
Topics: Insect macrofossils, Insect macrofossils - beetles, Stratigraphy, Periglacial features - fossil ice wedges, Plant macrofossils - peat, Plant macrofossils - wood, Plant macrofossils, Faunal remains - *Mammuthus*, Faunal remains - *Equus*, Faunal remains - *Camelops*, Faunal remains - *Bison priscus*, Faunal remains - *Rangifer tarandus*, Faunal remains - *Ovis nivicola*, Faunal remains - *Ovibos moschatus*, Faunal remains - *Dicrostonyx*, Faunal remains - *Microtus gregalis*, Pollen records - Alaska, Vegetation history - Alaska, Climate history - Alaska

1970 Quaternary Environmental History of Interior Alaska: Pollen Samples from Organic Colluvium and Peats. Arctic and Alpine Research 2:241-251.

Thick sequences of late Pleistocene frozen silts and peats are exposed in many areas of forested interior Alaska. Pollen samples from such sediments show, like other types of paleoenvironmental evidence (fossil mammals, fossil insects, etc.), that an arctic environment once prevailed in large areas of lowland interior Alaska. Furthermore, a few of these pollen samples are referred to Livingstone's Herb Zone, suggesting that the Late Wisconsin environment of lowland interior Alaska was similar in some respects to that of present day Barrow, Alaska. During that time, spruce woodlands would have been nearly eliminated from interior Alaska. Two of the pollen samples represent forested conditions. One of these, of probable interglacial age, provides the first evidence from interior Alaska of a westward advance of pines during the Pleistocene. Surface samples from interior Alaska are presented for comparison with the fossil pollen samples.

Location: AEU SCI G 1 A68
Area: Eastern Beringia, Alaska - central
Topics: Insect macrofossils, Pollen analysis - Alaska, Pollen analysis - modern pollen spectra, Plant macrofossils - peat, Plant macrofossils - wood, Vegetation history - Alaska, Stratigraphy, Loess, Periglacial features - fossil ice wedges, Faunal remains - *Microtus gregalis*, Faunal remains - *Dicrostonyx torquatus*, Faunal remains - *Citellus undulatus*

1973 ***Quaternary Environments at Cape Deceit (Seward Peninsula, Alaska): A Contribution Towards an Understanding of the Evolution of Tundra Ecosystems.*** **Unpublished Ph.D. dissertation. Department of Geology, University of Alberta, Edmonton, Alberta. vi + 123 pages.**

Unconsolidated sediments at Cape Deceit near Deering, Alaska range in age from latest early Pleistocene to Holocene. Plant and insect fossils from these sediments, as well as certain sedimentary features, provide evidence for documenting evolution of the terrestrial ecosystem at Deering.

A tundra ecosystem functioned at Deering for most of the time represented by the Cape Deceit sedimentary sequence. The regional tundra environment of northern Seward Peninsula during early Pleistocene time was similar to that of the present; however, the local environment at Cape Deceit was quite different, being only scantily vegetated. Starting in the middle Pleistocene the regional tundra vegetation evidently became more grassy, a trend which culminated in steppe-tundra conditions during latest Wisconsin time.

Former period of warmer climate at Deering are indicated by evidence for westward movement of treeline. The last time forest or forest-tundra existed at Deering was no later than the penultimate interglacial. Spruce treeline stood closer to but not at Deering during the Sangamon interglacial. At least once, during latest early Pleistocene time, treeline at Deering was comprised of larch instead of spruce.

Most ecosystem evolution which has occurred at Deering is of the non-phyletic type, *i.e.* involving little or no *in situ* evolution of plants and animals. The only definite evidence of evolution among insects during the 400,000 or more years represented by the Cape Deceit sequence is reduction of flight wings in *Tachinus apterus* (Coleoptera: Staphylinidae).

Location: AEU SP COLL 73-42D
Area: Eastern Beringia, Alaska - western
Topics: Insect macrofossils, Plant macrofossils, Stratigraphy, Vegetation history - Alaska, Palaeontological sites - Cape Deceit

1974 Wisconsin Environment of Interior Alaska: Pollen and Macrofossil Analysis of a 27 Meter Core from the Isabella Basin (Fairbanks, Alaska). Canadian Journal of Earth Sciences 11:828-841.

Information on the Wisconsin environment of interior Alaska has been obtained from study of pollen as well as the plant and animal macrofossils contained in sediments of a 27 m core at Isabella Creek, near Fairbanks, Alaska. The pollen assemblages indicate three major zones.

Zone A (35 000 to 32 000 BP) represents a mid-Wisconsin interstadial during which spruce treeline was lower in elevation than at present though not nearly as low as during early and late Wisconsin time. Zone B represents a late Wisconsin interval of severe arctic climate. Forests disappeared from interior Alaska or were greatly diminished and much of the region was characterized by steppe-tundra vegetation. Steppe conditions may have been favored by rapid deposition of primary and reworked loess. Zone C shows that spruce forests and some of the associated boreal biota had returned to interior Alaska by 8500 years BP. A fluctuation of alder percentages within Zone C may result from mid-Holocene warming.

Plant macrofossils from the Isabella sequence show that some species now having a boreal or taiga distribution survived the late Wisconsin of interior Alaska in a steppe-tundra environment. Other plants that were growing at Isabella during mid-Wisconsin time apparently became extinct in Alaska during the late Wisconsin.

Location: AEU SCI QE 1 C212
Area: Eastern Beringia, Alaska - central
Topics: Refugia, Periglacial features, Pollen analysis - Alaska, Plant macrofossils, Insect macrofossils, Ostracodes, Molluscs, Treeline fluctuations - arctic, Vegetation history - Alaska, Climate history - Alaska, Palynological sites - Isabella, Clay mineralogy, Geochemistry

1974 Quaternary Environments at Cape Deceit (Seward Peninsula, Alaska): Evolution of a Tundra Ecosystem. Geological Society of America Bulletin 85:1353-1384.

Unconsolidated sediments at Cape Deceit near Deering, Alaska, range in age from latest early Pleistocene to Holocene. Plant and insect fossils from these sediments, as well as certain sedimentary features, provide evidence for documenting evolution of the terrestrial ecosystem at Deering.

A tundra ecosystem functioned at Deering for most of the time represented by the Cape Deceit sedimentary sequence. The regional tundra environment of northern Seward Peninsula during early Pleistocene time was similar to that of the present; however, the local environment at Cape Deceit was quite different, being only scantily vegetated. Starting in the middle Pleistocene, the tundra of the northern Seward Peninsula evidently became more grassy, a trend culminating with steppe-tundra by latest Wisconsin time.

Former periods of warmer climate at Deering are indicated by evidence for westward movement of tree line. The last time forest or forest-tundra existed at Deering was no later than the penultimate interglacial. Spruce tree line probably stood closer to but not at Deering during the Sangamon interglacial. At least once, during latest early Pleistocene time, tree line at Deering was composed of larch instead of spruce.

Except for the mammalian component, most ecosystem evolution at Cape Deceit during the last 400,000 yr or more has apparently involved little in situ evolution of taxa. The maximum degree of phyletic evolution to be documented here is reduction of the flight wings of the tundra beetle species, *Tachinus apterus*. Most of the phylogenetic splitting that has given rise to pairs or groups of closely related arctic species (especially among the beetles) probably occurred well before the early Pleistocene during initial formation of the lowland tundra realm.

Location: AEU SCI QE 1 G341
Area: Alaska - western, Eastern Beringia
Topics: Palynological sites - Cape Deceit, Palaeontological sites - Cape Deceit, Stratigraphy, Vegetation history - Alaska, Climate history - Alaska, Pollen analysis - Alaska, Plant macrofossils - wood, Plant macrofossils - peat, Insect macrofossils, Faunal associations, Faunal remains - Alaska, Periglacial features - fossil ice wedges, Treeline fluctuations - arctic, Beringian vegetation, Beringian ecology

1975 Insects and Plant Macrofossils from Two Quaternary Exposures in the Old Crow-Porcupine Region, Yukon Territory, Canada. Arctic and Alpine Research 7:249-259.

Insect fossils and plant macrofossils have been recovered at two exposures in the Old Crow-Porcupine region (northern Yukon Territory). One assemblage of fossils, from an exposure on the Porcupine River in the Bluefish Basin, is probably about 32,400 years old, while the other, from an exposure in the Old Crow Basin, is older than 44,000 years.

Both assemblages seem to have been deposited when the sites from which they come were within a region of forest-tundra. The Porcupine River assemblage indicates that tree line along the middle Porcupine drainage during mid-Wisconsin time was significantly lower than at present. At that time more northern areas such as the Old Crow Basin would have been totally treeless in contrast with the forest-tundra vegetation there today.

The Old Crow assemblage probably represents climatic conditions as warm as at present. It includes fossils of one insect species and two plant species that do not occur today in the Old Crow Basin. The insect, a beetle (*Micralymma brevilingue* Schiødt), is now found farther north in a special type of tundra habitat. One of the plants, *Alnus incana*, may be absent today simply because of paucity of suitable habitat. The other, *Najas flexilis*, has a contemporary northern limit far to the south of the Yukon Territory. Because *Najas* does not grow in the Yukon Territory today, it is possible that its fossils imply warmer climate. However, such a conclusion is tempered by the further possibility that *Najas* is absent today not because of present climatic conditions but because of the severity of late Wisconsin climate in eastern Beringia (the Alaska-Yukon unglaciated refugium).

Location: AEU SCI G 1 A68
Area: Eastern Beringia, Yukon - northern
Topics: Climate history - Yukon, Treeline fluctuations - arctic, Palaeontological sites - Old Crow, Palaeontological sites - Yukon, Stratigraphy, Faunal remains - *Mammuthus*, Faunal remains - *Camelops*, Faunal remains - *Ochotona*, Faunal remains - *Castoroides*, Faunal remains - *Castor*, Faunal remains - *Rangifer tarandus*, Plant macrofossils - wood, Plant macrofossils - *Najas flexilis* seeds, Plant macrofossils - *Alnus incana*, Molluscs, Insect macrofossils - beetles, Vegetation history - Yukon

1976 Arctic-Steppe - An Extinct Biome. In *AMQUA, 4th Biennial Meeting, Tempe, Arizona, Abstracts*, pp. 73-77.

Area: Alaska, Yukon, Beringia

Topics: Sea level changes, Beringian land bridge connection, Beringian vegetation, Pollen records, Faunal remains, Review of vegetation history - Beringia, Climate history, Beringian ecology

1982 East Beringia During Late Wisconsin Time: A Review of the Biotic Evidence. In *Paleoecology of Beringia*, edited by D. M. Hopkins, J. V. Matthews Jr., C. E. Schweger and S. B. Young, pp. 127-150. Academic Press, New York, New York.

The nature of the late Pleistocene environment of Beringia is a topic of current debate. Some have concluded that it was a large arctic-steppe biome which supported an ungulate fauna as diverse as that of certain temperate grasslands. Others argue that the late Wisconsin vegetation of much of East Beringia was similar to present arctic and alpine fell field. They claim that the evidence for either large numbers or diversity of ungulates during late Wisconsin time is deficient or nonexistent.

Although comparisons with the fauna of the African plains are inappropriate, several lines of evidence do show that the number of large-mammal species existing together in East Beringia during the late Pleistocene was several times larger than that of the existing tundra fauna. Prominent were *Mammuthus primigenius*, *Bison priscus*, *Equus*, several types of musk ox, and *Rangifer*. In spite of the apparent low pollen production in late Pleistocene plant communities, sufficient forage must have existed to support this unique ungulate community.

Herb-dominated pollen spectra representing the height of the late Wisconsin have attributes, such as high percentages of *Artemisia* and dominance of grass over sedge, that set them apart from the majority of lowland tundra surface samples; consequently, these herb-zone fossil spectra are thought to indicate an environment different from that of present tundra.

Macrofossils of plants and insects add dimension to this picture. They show that late Pleistocene treeless environments contained species and probably whole communities not found in East Beringia today. Many of the plant and insect fossils imply prevalence of steppe-like conditions.

When all evidence pertaining to Beringian environments is collated, the most probable reconstruction is of a treeless region composed of a mosaic of communities, among which were large tracts that can only be termed steppe-like. It is probable that both alpine fell field and some of the rare steppe sites in present day Alaska-Yukon harbor species which formerly occupied these steppe areas.

The late Wisconsin has been viewed as the last time when presently disjunct steppe species in the U.S.S.R. and East Beringia had continuous ranges. But if the land bridge itself acted to promote increased continentality in Beringia, then the exchange of steppe taxa may have occurred during the mid-Wisconsin or even earlier. Certainly, it is becoming clearer that the land bridge acted as a filter for certain steppe organisms during late Wisconsin time.

Location: AEU SCI QE 720 W47, AEA PMA/ASA 560.45 P174
Area: Eastern Beringia
Topics: Beringian land bridge connection, Beringian vegetation, Beringian environment, Review of pollen studies - Beringia, Plant macrofossils, Review of vegetation history - Beringia, Insect macrofossils, Taphonomy, Faunal remains, Dating - analysis of radiocarbon dates

Matthews Jr., J. V., and C. E. Schweger

1985 Old Crow Tephra: Its Significance for Understanding the Early and Middle Wisconsinan Climate History of Eastern Beringia. In *Climatic Change in Canada 5: Critical Periods in the Quaternary Climatic History of Northern North America*, edited by C. R. Harington, pp. 453-459. Syllogeus No. 55. National Museums of Canada, Ottawa, Ontario.

Certain types of geological phenomena allow one to delineate specific "instants" in geological time. Geomagneticpolarity reversals and volcanic tephras are two well known examples. One volcanic tephra that is gaining importance for understanding the late Quaternary climatic history of eastern Beringia (Alaska and the Yukon) is the Old Crow tephra. It occurs at a number of sites in eastern Beringia, and was apparently deposited during the early Wisconsinan - a period for which our resolution of climatic events is especially blurry. In addition to its value for describing climate and vegetation at the instant of the ash fall, Old Crow tephra contributes to a knowledge of climatic events that occurred long after its deposition. Also, because at several localities the tephra is associated with glacial drift, it provides new information on the timing of glacial events in eastern Beringia.

Notes: Abstract taken from introduction.
Location: AEU SCI QH 1 S985
Area: Eastern Beringia, Yukon
Topics: Tephra - Old Crow, Plant macrofossils, Pollen records - Eastern Beringia, Palaeomagnetism, Climate history - Eastern Beringia, Vegetation history - Eastern Beringia

Matthews Jr., J. V., C. E. Schweger, and O. L. Hughes

1989 Climatic Change in Eastern Beringia During Oxygen Isotope Stages 2 and 3: Proposed Thermal Events. In *Late Cenozoic History of the Interior Basins of Alaska and the Yukon*, edited by L. D. Carter, T. D. Hamilton and J. P. Galloway, pp. 34-38. Circular 1026. United States Geological Survey.

Location: AEU SCI QE 75 C57
Area: Eastern Beringia, Yukon - central
Topics: Pollen analysis - Eastern Beringia, Palynological sites - Mayo Indian Village, Tephra - Old Crow, Tephra - Sheep Creek, Dating - TL, Climate history - Eastern Beringia, Plant macrofossils - wood, Plant macrofossils - *Corispermum hyssopifolium* seeds, Plant macrofossils - seeds, Insect macrofossils

1990 Plant and Insect Fossils from the Mayo Indian Village Section (Central Yukon): New Data on Middle Wisconsinan Environments and Glaciation. Géographie physique et Quaternaire 44:15-26.

The Mayo Indian Village Section in central Yukon contains the Mayo Till, representing the Wisconsinan McConnell Glaciation, underlain by fluvial sediments with rare detrital organics. Previous ^{14}C dates from the till or underlying sediments have failed to adequately define the age of the McConnell Glaciation. A new accelerator date (29.6 ka BP) on seeds of *Corispermum hyssopifolium* from subtill deposits shows that the McConnell Glaciation is probably Late Wisconsinan in age and that it correlates with the Kluane Glaciation (Kluane Lake area), McCauley Glaciation (Snag-Klutlan region) and the glaciation represented by "Till D" at the Tom Creek Section (Liard Plain). This conclusion and a new date on Old Crow tephra mean that the Reid, Mirror Creek and possibly Shakwak glaciations are of Illinoian age. Plant fossils (pollen and seeds) and insect fossils from detrital organics associated with the 29.6 ka BP date portray an essentially treeless environment. Even though typical low arctic plants such as heaths, shrub birch and alder are rare to absent, both pollen and macrofossils suggest a climate no colder than present low arctic tundra, although, it was probably drier. Spruce may have survived in the region, but only as small groves rather than as a riparian forest.

Location: AEU SCI G 1 R452
Area: Eastern Beringia, Yukon - central
Topics: Pollen analysis - Yukon, Palynological sites - Mayo Indian Village, Tephra - Old Crow, Dating - analysis of radiocarbon dates, Climate history - Yukon, Plant macrofossils - wood, Plant macrofossils - *Corispermum hyssopifolium* seeds, Plant macrofossils - seeds, Insect macrofossils, Glacial history - Yukon, Stratigraphy

Matthews Jr., J. V., C. E. Schweger, and J. A. Janssens

1990 The Last (Koy-Yukon) Interglaciation in the Northern Yukon: Evidence from Unit 4 at Ch'ijee's Bluff, Bluefish Basin. Géographie physique et Quaternaire 44:341-362.

The effects of predicted anthropogenic warming can be assessed in part by documenting responses to past warming events. One of the most pronounced warmings was the last interglaciation - stage 5 of the marine isotope record. A large multinational and multidisciplinary project (CELIA) was launched recently in order to gain detailed knowledge of the climate during stage 5. Several key exposures were identified by CELIA; one of them is Ch'ijee's Bluff on the Porcupine River, northern Yukon. Pollen, plant and insect macrofossils and stratigraphic evidence from Ch'ijee's Bluff show that the part of Ch'ijee's Unit 4 that is above and younger than Old Crow tephra (OCt) was deposited during an interval of climate warmer than present. When OCt was dated at 85 ka BP, the subsequent warming interval was presumed to be correlative with the early part of marine isotope stage 3. New dates on OCt show it to be 140-150 ka BP, and this means that the warm interval discussed here is more likely of stage 5 than stage 3 age. We apply the informal epithet, "Koy-

Yukon interglaciation", to it and compare the Ch'ijee's Bluff Unit 4 sequence with other east Beringian sites that contain both Old Crow tephra and putative interglacial deposits.

Location: AEU SCI G 1 R452
Area: Yukon - northern, Eastern Beringia
Topics: Palynological sites - Ch'ijee's Bluff, Palaeomagnetism, Dating - analysis of radiocarbon dates, Plant macrofossils - bryophytes, Stratigraphy, Pollen analysis - Yukon, Insect macrofossils - beetles, Plant macrofossils - wood, Plant macrofossils - peat, Periglacial features - fossil ice wedges, Climate history - Yukon, Tephra - Old Crow

McCourt, G. H.

1982 *Quaternary Palynology of the Bluefish Basin, Northern Yukon Territory*. Unpublished M.Sc. dissertation. Department of Geology, University of Alberta, Edmonton, Alberta. xiii + 165 pages.

Pollen analysis of an alluvial exposure (67° 23' N latitude, 140° 21.5' W longitude) along the Bluefish River, Northern Yukon Territory, provides further information on the paleoecological changes that have taken place in the interior Yukon and Alaska during the Quaternary. The sediments are all Pleistocene in age and maybe [sic] subdivided into three stratigraphic units: (1)A lower Bluefish unit, characterized by organic valley fill alluvial sediments, is thought to have been deposited prior to the Sangamon Interglacial. The basal sediment of this unit maybe [sic] earliest Pleistocene in age. (2)A middle Bluefish unit, which was not analysed for pollen, is a channel fill deposit that was probably laid down during the Sangamon Interglacial. (3)An upper Bluefish unit documents the Middle and Late Wisconsin and is represented by near shore lacustrine and deltaic sediments. A peat layer that overlies the section is considered to Holocene [sic] in age.

Two statistical analytical methods, Cluster Analysis and Principal Component Analysis, were applied to the pollen data from the Bluefish River section in an attempt to confirm the patterns that had been visually observed within the data. The results of the statistical analysis along with the visually observed results suggested the establishment of eight pollen zones.

The oldest pollen zone (BF 8) represents a pre-Illinoian Interglacial during which time the area was covered by an open spruce forest. Climatically the region experienced more precipitation and warmer temperatures than today. Prior to the onset of the Illinoian Glaciation the open forest was replaced by an open shrub-birch tundra (BF 7), rich in sedges and *Artemisia* A shrub-tundra also characterizes subzone BF 6b, but now Cyperaceae is the dominant ground cover. An increase in *Artemisia* and further reductions in the arboreal and shrub components, indicates subzone BF 6a was an open tundra. Zones BF 7 and BF 6 suggest increasingly colder temperatures and much more arid conditions. An amelioration of the climate with increased temperatures and precipitation during the time of Zone BF 5 (beginning of the Sangamon Interglacial) allowed the steppe-tundra to be replaced by a rich birch-alder shrub-tundra.

A steppe tundra vegetation (Zone BF 4) dominated by Cyperaceae, Gramineae and *Artemisia* covered the region during the Middle and Late Wisconsin. The pollen spectra for Zone BF 3 indicates the vegetation was predominantly a treeless shrubless grassland. Pollen zones BF 4 and BF3 infer a climate of arctic cold and extreme aridity. A major pre-Quaternary spore zone near the top of the study section has been designated Zone BF 2. Grain size changes, slumping, reworking of sediments and variations in the pollen rain are all possible reasons for the presence of this zone. The pollen spectra for Zone BF 1 is very similar to the present day vegetation (Boreal Forest). Spruce is the dominant tree, with alder and birch common in the shrub layer.

Location: AEU SP COLL 82F-115
Area: Eastern Beringia, Yukon - northern
Topics: Pollen analysis - Yukon, Vegetation history - Yukon, Multivariate statistics, Stratigraphy

Messenger, J.

1978 Wisconsin Paleogeography of Alsaka [sic]. In *AMQUA, 5th Biennial Meeting, Edmonton, Alberta, Abstracts*, p. 171.

Location: AEU HSS QE 696 A5212
Area: Eastern Beringia, Alaska
Topics: Permafrost, Climate history - Alaska, Palaeowinds, Loess, Beringian vegetation

Moran, J. M.

1976 Glacial Maximum Tundra: A Bioclimatic Anomaly? In *AMQUA, 4th Biennial Meeting, Tempe, Arizona, Abstracts*, p. 153.

Area: Eastern Beringia
Topics: Permafrost, Climate history

Morgan, A. V., A. Morgan, A. C. Ashworth, and J. V. Matthews Jr.

1983 Late Wisconsin Fossil Beetles in North America. In *Late-Quaternary Environments of the United States Volume 1 The Late Pleistocene*, edited by S. C. Porter, pp. 354-363. University of Minnesota Press, Minneapolis, Minnesota.

Notes: H. E. Wright Jr. (series ed.).
Location: AEU SCI QE 696 L35
Area: Alaska, Eastern Beringia
Topics: Review of palaeoentomology - North America, Refugia, Climate history, Insect macrofossils - beetles, Vegetation history, Pollen records, Zoogeography - beetles

Morlan, R. E., and J. V. Matthews Jr.

1982 Taphonomy and Paleoecology of Sub-Fossil Insect Assemblages from Old Crow River Loc. 15, Northern Yukon Territory. Abstracts of Papers. Journal of Paleontology 56:19.

Notes: Abstracts from North American Paleontological Convention III.
Location: AEU SCI QE 701 J86
Area: Eastern Beringia, Yukon - northern
Topics: Palaeontological sites - Old Crow, Insect macrofossils, Taphonomy

Murray, D. F.

1978 Megaberingian Floristic Elements and the Paleoecology of the Ice-Free Corridor. In *AMQUA, 5th Biennial Meeting, Edmonton, Alberta, Abstracts*, pp. 35-37.

Location: AEU HSS QE 696 A5212
Area: Eastern Beringia, Alaska - northern
Topics: Ice-free corridor, Vegetation history - *Populus*, Plant macrofossils - *Populus*

1980 Balsam Poplar in Arctic Alaska. Canadian Journal of Anthropology 1(1):29-32.

Location: AEU PMC GN 1 C22
Area: Eastern Beringia, Alaska
Topics: Biogeography - *Populus*, Vegetation history - *Populus*, Plant macrofossils - *Populus*

Nelson, R. E.

1986 Mid-Wisconsin Aridity in Northern Alaska: Incongruity of a Mesic Pollen Record and Xeric Insect Indicators. Current Research in the Pleistocene 3:57-59.

Location: AEU HSS E 61 C97
Area: Eastern Beringia, Alaska - northern
Topics: Pollen records - Alaska, Insect macrofossils - beetles

Nelson, R. E., L. D. Carter, and S. W. Robinson

1988 Anomalous Radiocarbon Ages from a Holocene Detrital Organic Lens in Alaska and their Implications for Radiocarbon Dating and Paleoenvironmental Reconstructions in the Arctic. Quaternary Research 29:66-71.

Eleven radiocarbon age determinations clearly show that a lens of Holocene fluvial organic debris on the Alaskan Arctic Coastal Plain contains mostly pre-Holocene organic material. Radiocarbon ages of identified plant macrofossils indicate the material was deposited about 9000 to 9500 yr B.P. Radiocarbon analyses of bulk samples from this deposit, however, range from 13,300 to 30,300 yr B.P. Most of the old organic matter seems to be in the smaller size fractions in the deposit, particularly in the fraction between 0.25 and 0.5 mm, but all size fractions are contaminated. Particular caution must be exercised in submitting bulk samples for radiocarbon dating from areas where conditions favor redeposition of isotopically "dead" carbon.

Location: AEU SCI QE 696 Q24
Area: Eastern Beringia, Alaska - northern
Topics: Dating - analysis of radiocarbon dates, Dating - contamination problems, Plant macrofossils - wood, Plant macrofossils - *Populus* leaves, Plant macrofossils - *Corispermum*

Nimis, P. L.

1982 Phytogeography of Periglacial Steppes in the Yukon Territory (Canada). Colloques phytosociologiques 11:1-13. Strasbourg, France. Les pelouses calcaires.

Periglacial stepps [sic] were a common feature of the vegetational landscape in Western Siberia during xeric phases of the glacial period. In Southwestern Yukon a comparable vegetation, dominated by *Artemisia*- and *Agropyron*- species occurs in the climatically very continental area around Kluane, at the leeside of the St. Elias Mountains. During most of Pleistocene, the unglaciated portions of Alaska-Yukon were connected with Asia by means of the Bering Land Bridge, and separated from the continental mainland by the North American ice-sheet. In spite of this, the main phytogeographical affinities of the stepps [sic] in the Yukon are with the sagebrush grasslands of the Cordillera and of Central North America. The main reasons for this fact are probably the opening of a narrow deglaciated corridor connecting Beringia with Central North America during xeric interglacials, and the influence of maritime climate in Eastern Siberia during Pleistocene, that effectively partitioned the west-siberian stepps [sic] from the ones occurring in Alaska-Yukon.

Area: Eastern Beringia, Yukon - southern
Topics: Pollen records - Yukon, Biogeography, Beringian vegetation, Ice-free corridor

Ovenden, L.

1986 Developmental Patterns in Peat Deposits of Former Lake Basins in Northern Yukon. In *AMQUA, 9th Biennial Meeting, Champaign, Illinois, Program and Abstracts*, p. 159.

Location: AEU HSS QE 696 A5212
Area: Eastern Beringia, Yukon - northern
Topics: Periglacial features - thermokarst, Peat cores, Permafrost, Vegetation history - Yukon, Pollen analysis - Yukon, Plant macrofossils - *Picea* needles

Peteet, D. M., and M. Rubin

1986 Paleoecology of the Malaspina and Bering Glacier Districts, Alaska. In *AMQUA, 9th Biennial Meeting, Champaign, Illinois, Program and Abstracts*, p. 13.

Location: AEU HSS QE 696 A5212
Area: Eastern Beringia, Alaska - southern
Topics: Pollen analysis - Alaska, Vegetation history - Alaska, Plant macrofossils - *Picea*, Plant migration, Plant macrofossils - seeds

Rampton, V.

1971 Late Quaternary Vegetational and Climatic History of the Snag-Klutlan Area, Southwestern Yukon Territory, Canada. Geological Society of America Bulletin 82:959-978.

Present vegetation in the Snag-Klutlan area has a general altitudinal zonation; tree line being between 4100 and 4400 ft elevation on almost all slopes. Pollen spectra from surface samples below tree line generally reflect the vegetational composition. Those from above tree line, however, do not always reflect the surrounding vegetation, because they contain a large amount of pollen originating from below tree line.

A pollen diagram from pond sediments suggests the following vegetational sequence for the last 31,000 yrs: 31,000 B.P. through 27,000 B.P., fell-field or sedge-moss tundra followed by shrub tundra; 27,000 B.P. through 10,000 B.P., sedge-moss tundra; 10,000 B.P. through 8700 B.P., shrub tundra; 8700 B.P. through 5700 B.P., spruce woodland; 5700 B.P. through present, spruce forest. The diagram also suggests the following negative departures of July temperatures: 31,000 B.P. through 27,000 B.P., at least 8°F and possibly as much as 16°F; 27,000 B.P. through 13,500 B.P., 13°; 13,500 B.P. through 10,000 B.P., 12°F; 10,000 B.P., through 8700 B.P., 8°F. Precipitation seems to have been lower during cooler intervals than are present levels. Precipitation also seems to have increased over the last 6000 yrs.

Logs above the present tree line imply that summer temperatures have fluctuated above present values between 6000 B.P. and 1220 B.P. Tree-ring studies indicate that temperatures during the 200 yrs preceding 1940 were as much as 2°F cooler than present.

Location: AEU SCI QE 1 G341
Area: Eastern Beringia, Yukon - southwestern
Topics: Palynological sites - Antifreeze Pond, Pollen analysis - Yukon, Vegetation history - Yukon, Climate history - Yukon, Modern biogeography, Treeline fluctuations

Rampton, V. N.

1970 Late Quaternary Vegetation Changes in the Western Yukon Territory, Canada: Their Relationship to the Regional Late Wisconsin Glacial History. In *AMQUA, 1st Biennial Meeting, Abstracts*, p. 109.

Location: AEU HSS QE 696 A52
Area: Eastern Beringia, Yukon - southwestern
Topics: Palynological sites - Antifreeze Pond, Lake cores, Glacial history - Yukon, Pollen analysis - Yukon, Vegetation history - Yukon, Climate history - Yukon

Ritchie, J. C.

1976 The Modern and Late Pleistocene Vegetation of the Campbell-Dolomite Upland, near Inuvik, Northwest Territories, Canada. In *AMQUA, 4th Biennial Meeting, Tempe, Arizona, Abstracts*, p. 114.

Area: Eastern Beringia, Northwest Territories - western
Topics: Pollen analysis - multivariate statistics, Lake cores, Pollen analysis - Northwest Territories, Vegetation history - Northwest Territories

1977 The Modern and Late Quaternary Vegetation of the Campbell-Dolomite Uplands, near Inuvik, N.W.T. Canada. Ecological Monographs 47:401-423.

The Campbell-Dolomite uplands comprise a small area (140 km^2) of outcropping, faulted dolomite, limestone, and shale east of the Mackenzie River Delta, ≈40 km south of the northern limit of trees. The major landforms are bedrock ridges and plateaux, steep colluvium, stable slopes, shorelines, and depressions. A principal component analysis of vegetation-cover data from 150 stands suggest that much of the variation within the heterogeneous vegetation is correlated with these broad habitat categories. Stable surfaces bear an open spruce woodland with alder, tree and dwarf birch, and a varied lichen-heath-*Dryas* ground vegetation.

A glacially modified karstic (solution) depression contains a small (8 ha), relatively deep (22 m), apparently meromictic lake, which yielded a 12,000-yr core of sediment. A conventional percentage diagram, an influx diagram, and numerical analysis (principal components) suggest a sequence of pollen assemblage zones as follows: (1) *Salix*-Gramineae-*Artemisia*: 13,000 to 11,300 radiocarbon yr ago, (2) *Betula* (shrub)-*Salix*-Gramineae-*Artemisia*: 11,300 to 10,300, (3) *Betula-Populus*: 10,300 to 9,700, (4) *Betula-Populus-Juniperus*: 9,700 to 8,900, (5) *Picea-Betula* (tree and shrub)-*Juniperus*: 8,900 to 6,500, and (6) *Picea-Betula-Alnus*: 6,500 to present. Both percentage data and numerical analyses show that none of the pollen assemblage zones 1 to 5 has a modern analogue.

With 1 exception, these patterns of change in pollen spectra can be interpreted parsimoniously without reference to regional environmental change. They suggest an initial phase of migration of willow and herbs from adjacent unglaciated Megaberingia (North Yukon and Alaska), followed rapidly by dwarf birch and later poplar. Megaberingian florist elements (e.g., *Plantago canescens*, *Selaginella sibirica*) reached the area during this early phase of migration. Subsequently arriving from the south along the Mackenzie valley were juniper, ericads, spruce, and finally alder, which intensified competition and restricted the early Megaberingian herb types to open, unstable habitats where they persist today. Slow soil development (humus accumulation, rising permafrost table) probably favoured the spread of the palynologically "silent" elements — lichens, ericads, and *Dryas* (the dominants of the modern ground vegetation). Changes in the influx values of *Picea* suggest a climatically induced increase in tree density and/or pollen production during the period 9,000-7,000 BP (Zone 5).

Location: AEU SCI QH 540 E28
Area: Eastern Beringia, Northwest Territories - northwestern
Topics: Refugia, Plant migration, Beringian vegetation, Climate history - Northwest Territories, Vegetation analysis, Pollen analysis - modern pollen spectra, Pollen analysis - multivariate statistics, Palynological sites - M Lake, Palynological sites - L Lake, Pollen analysis, Vegetation history - Northwest Territories

1978 The Palaeoecology of the Ice-Free Corridor. In *AMQUA, 5th Biennial Meeting, Edmonton, Alberta, Abstracts*, pp. 24-30.

Location: AEU HSS QE 696 A5212
Area: Eastern Beringia, Yukon - northern, Alaska - eastern, Northwest Territories
Topics: Ice-free corridor, Review of vegetation history - Canada - western, Climate history, Pollen records, Insect macrofossils, Plant migration, Faunal remains, Molluscs, Refugia

1980 Towards a Late-Quaternary Palaeoecology of the Ice-Free Corridor. Canadian Journal of Anthropology 1(1):15-28.

The palaeoecology of the area known as the ice-free corridor is as poorly understood and documented as the geological evidence that there was in fact such an area. In the northern, Beringian portion the full-glacial (maximum 18,000 BP) was characterized by impoverished, tundra communities reflecting an environment colder, drier and less productive than during the Holocene and present-day. Most sites of greater apparent age (Middle Wisconsin), while they have yielded large numbers of vertebrate fossils, either lack stratigraphic context entirely or have stratigraphy of uncertain age and provenance. There is fragmentary evidence for Middle Wisconsin interstadial episodes that supported productive boreal woodland ecosystems.

Notes: See Ritchie 1978 (5th AMQUA abstract)
Location: AEU PMC GN 1 C22
Area: Eastern Beringia, Northwest Territories - western, Yukon - northern, Alaska - eastern
Topics: Ice-free corridor, Biogeography, Review of vegetation history - Canada - western, Pollen records, Vegetation analysis, Ostracodes, Molluscs, Climate history

1981 Problems of Interpretation of the Pollen Stratigraphy of Northwest North America. In *Quaternary Paleoclimate*, edited by W. C. Mahaney, pp. 377-391. Geo Abstracts, Norwich, England.

The role of pollen analysis in Quaternary environmental reconstruction has been reinforced by several recent discoveries and by improved techniques. The reports of continuous pollen records in primary sediment through at least the last complete glacial-interglacial cycle have provided the basis for correlation between the marine record and terrestrial sites. As a result, it is becoming possible to discern cycles of regional vegetation response correlated with periodic shifts of climate between glacial and nonglacial or stadial and nonstadial modes.

Concurrently, plant ecologists are developing new theories of plant succession, at least for temperate forest regions, based on the 'response to periodic disasters' notion rather than the traditional 'progression to climax' view. Paleoecologists are beginning to search for repositories with records sufficiently sensitive to yield data interpretable in terms of community dynamics, in addition to paleoenvironmental reconstructions.

Pollen data from one site in the south Richardson Mountains of the Yukon Territory illustrate the limitations imposed by investigations in a region of great geological (bedrock) and topoclimatic diversity. A tentative paleoclimatic reconstruction is offered for the period 16,000 to 11,000 BP, equivalent to the modern gradient from mid-arctic through low-arctic to northern boreal zones.

Location: AEU SCI QC 884 Q25
Area: Eastern Beringia, Yukon - northern
Topics: Vegetation analysis, Palynological sites - Lateral Pond, Pollen analysis, Vegetation history

1982 The Modern and Late-Quaternary Vegetation of the Doll Creek Area, North Yukon, Canada. The New Phytologist 90:563-603.

The modern vegetation of the mountainous Doll Creek region consists of tundra on surfaces above roughly 700 m elevation and spruce woodlands on lower slopes and valleys. Ordination of quadrat cover data by detrended correspondence analysis displays the characteristics and relationships of the vegetation. Tundra on non-calcareous parent materials is distinctive, dominated by *Betula glandulosa*, *Arctostaphylos alpina*, *Ledum decumbens* and *Salix arctica*. Limestone ridge surfaces, by contrast, support a tundra dominated by *Dryas integrifolia*, *Carex scirpoidea* and *Cetraria* species; lower slopes on limestone are dominated by a *Dryas-Cassiope-Tomenthypnum* cover which also characterizes the ground vegetation of *Picea glauca* woodlands on lower surfaces. Bottomland mires are dominated by *Picea mariana-Sphagnum* woodlands and moraines support a *Picea mariana-Betula glandulosa*-ericad community. *Larix laricina* shares dominance with *Picea glauca* at treeline on northwest-facing gulley surfaces where deep and persistent snow appears to be important.

A detailed pollen analysis of one site, using percentage and influx diagrams, running means of influx of the main taxa, and a pollen influx-vegetation representation calibration method, reveals that immediately following the maximum of the latest glacial cycle (18 000 B.P.) the area supported a sparse, unproductive herb tundra on the lower montane slopes and a sedge-grass marsh complex in poorly drained sites. Between 16 000 and 12 500 ^{14}C years rapid changes in the plant populations occurred, particularly involving species of willow, grass, sedge and herbs. By 12 500 the entire area was occupied by a mosaic of treeless communities in response to a slow amelioration of the climate. At 12 000 a rapid transition from a warming glacial to a non-glacial climate stimulated the spread of dwarf shrubs (ericads and birch), increased organic sedimentation, soil humification and paludification, and a gradual increase in spruce until the modern extent and structure of woodland complexes was reached at about 7500 B.P. Slight changes did occur later (6000 B.P.) as alder and tree birch expanded to their modern modest status in vegetation.

The oldest radiocarbon age recorded for these lake sediments is 16 000 years, suggesting that, contrary to the original hypothesis, the extensions of Laurentide ice that occupied Doll Creek valley and adjacent areas were part of the latest glacial maximum (18 000 to 20 000 years B.P.).

Location: AEU SCI QK 1 N53
Area: Yukon - northern, Eastern Beringia
Topics: Treeline fluctuations - alpine, Palynological sites - Hanging Lake, Palynological sites - Lateral Pond, Palynological sites - Cwynar Lake, Palynological sites - M Lake, Palynological sites - Birch Lake, Palynological sites - Tyrrell Lake, Vegetation history - Yukon, Pollen analysis - Yukon, Climate history - Yukon, Glacial history - Yukon

1984 *Past and Present Vegetation of the Far Northwest of Canada*. University of Toronto Press, Toronto, Ontario. 251 pp.

Location: AEU SCI QE 931.3 R59, AEA PMA/ASA 561.197191 R511
Area: Eastern Beringia, Northwest Territories - western
Topics: Pollen analysis, Pollen analysis - modern pollen spectra, Review of vegetation history - Eastern Beringia, Climate history, Pollen analysis - multivariate statistics, Refugia, Beringian vegetation

1985 Quaternary Pollen Records from the Western Interior and the Arctic of Canada. In *Pollen Records of Late-Quaternary North American Sediments*, edited by V. M. Bryant Jr. and R. G. Holloway, pp. 327-352. American Association of Stratigraphic Palynologists Foundation, Dallas, Texas.

This paper represents an overview of the palynological records from the Canadian Arctic Archipelago, the continental Northwest Territories, the Yukon Territory, the eastern segment of the Province of British Columbia, and all of the Provinces of Alberta, Saskatchewan, and Manitoba. Pollen data from 218 sites have thus far been published for this area and they are mentioned in this article as to their name, location, palynologist who worked at the site, time span covered by the examined sediments, and supporting paleoecological data, if present. This summary article discusses a wide variety of sites ranging from a few early and middle-Pleistocene sites to a large number of Holocene records; thus the treatment of each site has, by necessity, been condensed. A final section mentioning some of the needs for future research in this region also is included.

Location: AEU SCI QE 993.2 P773, AEA PMA/ASA 561.13 P763
Area: Eastern Beringia, Yukon, Northwest Territories, Canada - western
Topics: Review of pollen analyses - Yukon, Review of pollen analyses - Northwest Territories, Review of vegetation history - Yukon, Palaeontological sites - Eastern Beringia

1985 Late-Quaternary Climatic and Vegetational Change in the Lower Mackenzie Basin, Northwest Canada. Ecology 66:612-621.

A 355-cm sediment sequence from Twin Tamarack Lake near Inuvik, Northwest Territories, Canada, provides a 14 500-yr record of pollen percentages and accumulation rates, interpretable in terms of climatic change and plant community dynamics. Four distinct pollen assemblage zones are recognized: a Gramineae-*Artemisia*-Cyperaceae-*Salix* zone from 14 500 to 11 800 BP; a *Betula glandulosa* zone from 11 800 to 8400 BP, subdivided into four subzones (Gramineae-herb, *Populus*, *Salix*, and *Juniperus*); a *Picea-Betula* zone, from 8400 to 5900 BP; and a *Picea-Betula-Alnus* zone from 5900 to 0 BP. The vegetation during the late-glacial at this site (14 500-11 800 BP) was relatively stable, consisting of sparse herb tundra on uplands in a slowly warming climate. Dwarf birch increased during this phase. The early Holocene period of maximum summer radiation produced thermal conditions ≈10% warmer than present, initiating a change from tundra to woodland at most sites, effected by the efficiently dispersed *Populus* (chiefly *P. balsamifera*). Relatively rapid changes in regional vegetation occurred during this period (11 800 to 6500 BP); *Juniperus* invaded the poplar woodlands, occupying well-drained, favorable sites, and later the slower-dispersed *Picea* (chiefly *P. glauca*) arrived and formed stands on alluvial sites, largely replacing poplar. At ≈7500 BP, *Betula papyrifera* spread on to the uplands; the accumulation of fuel, accelerated by the spread of conifer woodlands, likely caused an increase in fire frequency, which in turn maintained arboreal birch in the area. Fire opened up the woodlands locally and promoted the spread of *Alnus crispa*, expressed in the pollen record as a prominent rise in both percentage and PAR values. *Picea mariana* and other species adapted to mire habitats spread at this time (≈7000 BP) as paludification, peat growth, and permafrost aggradation occurred in the extensive lowlands. The termination of summers warmer than at present (≈6000 BP) initiated the development of a relatively stable vegetation that has persisted to the present.

Location: AEU SCI QH 540 E19
Area: Eastern Beringia, Northwest Territories - northwestern
Topics: Palynological sites - M Lake, Palynological sites - Twin Tamarack Lake, Pollen analysis - multivariate statistics, Plant migration, Vegetation history - *Picea*, Pollen analysis - Northwest Territories, Vegetation history - Northwest Territories, Climate history - Northwest Territories, Vegetation history - *Populus*

1987 *Postglacial Vegetation of Canada*. Cambridge University Press, Cambridge, England. 178 pp.

Notes: See especially Chapter 3: "Autecology and pollen representation" (pp. 29-59), Chapter 4: "Full-glacial refugia" (pp. 60-67), Chapter 7: "Pacific-Cordilleran region" (pp. 106-119), and Chapter 8: "Vegetation reconstruction and palaeoenvironments" (pp. 120-151).
Location: AEU SCI QE 931 R599, AEA PMA/ASA 561.1971 R511
Area: Canada - western, Eastern Beringia
Topics: Autecology, Pollen analysis, Pollen analysis - modern pollen spectra, Modern biogeography, Review of vegetation history - Canada, Climate history, Pollen analysis - multivariate statistics, Refugia

Ritchie, J. C., J. Cinq-Mars, and L. C. Cwynar
1982 L'Environnement Tardiglaciaire du Yukon Septentrional, Canada. Géographie physique et Quaternaire 36:241-250.

The Bluefish Caves site, located on a scarp of Devonian limestone in the northern boreal forest of the Yukon, has yielded pollen-bearing sediments in addition to abundant paleontological and some archaeological data. A pollen diagram based on samples of late-glacial loess overlain by Holocene humus shows two main pollen assemblages, the lower dominated by herbs and dwarf shrubs and the upper by spruce and alder. Based on these results, but also drawing on recent findings from other sites in N. Yukon, we offer the following reconstruction of the vegetation history of the region. The vegetation of the late-glacial period, from 16 000 to 12 000 BP, was a sparse herb tundra on upland surfaces and a complex of sedge-grass marshes with willow on lowlands. There was a notable change in cover at the beginning of the Holocene when spruce forest spread to all upland surfaces except the highest ridges, and paludification in the lowlands resulted in the spread of bog and mire communities.

Location: AEU SCI G 1 R452
Area: Yukon - northern, Eastern Beringia
Topics: Archaeological sites - Bluefish Caves, Palynological sites - Lateral Pond, Palynological sites - Hanging Lake, Faunal remains - Yukon, Geoarchaeology, Loess, Stratigraphy, Pollen analysis - Yukon, Vegetation history - Yukon
Language: French with English abstract.

Ritchie, J. C., and L. C. Cwynar
1982 The Late Quaternary Vegetation of the North Yukon. In *Paleoecology of Beringia*, edited by D. M. Hopkins, J. V. Matthews Jr., C. E. Schweger and S. B. Young, pp. 113-126. Academic Press, New York, New York.

The arctic-steppe concept is tested by scrutiny of two detailed late Pleistocene herb-zone pollen records from Hanging Lake (tundra) and Lateral Pond (woodland) in northern Yukon Territory and by consideration of other published pollen sequences in eastern Beringia. In particular, we examine the idea that Alaska and northern Yukon, when joined to Siberia by the Bering land bridge, "constituted the eastern end of a huge grassland biome, unequaled today in size and character."

Herb-zone pollen spectra consist largely of taxa whose modern affinities are arctic-alpine. Contrary to expectations of the arctic-steppe concept, herb-zone spectra do not show diversity of pollen taxa higher than in the modern pollen rain. Pollen influx rates are as low or lower than during the Holocene at the same sites and an order of magnitude lower than in modern central Canadian prairies. Influx rates for *Artemisia*, as well as for most of the other prominent herbs and grasses, are about the same in the herb zone as in younger pond sediments, although herb-zone taxa form much smaller percentages of the total pollen rain after birch, alder, and spruce appear in younger sediments. Pleistocene pollen spectra from western Europe are interpreted as representing open, discontinuous tundra or polar desert severely affected by frost action. The eastern Beringian herb zone also probably records discontinuous tundra vegetation floristically and physiognomically similar to communities found in eastern Beringia today on xeric, regosolic sites above the montane or beyond the arctic treeline. The communities represented by the herb zones are not extinct but are restricted in distribution now due to competition by species adapted to the more leached and humic Holocene soils and species that have immigrated or expanded in response to climatic amelioration.

We conclude that the "arctic steppe biome" never existed in eastern Beringia during the late Quaternary. The large and diverse ungulate populations probably were present during Pleistocene interstadials more than 30,000 years ago—intervals for which we lack adequate palynological records—rather than during the time of the herb zone, 30,000

to 14,000 years ago. It is doubtful that herb-zone vegetation could support a large and diverse population. Termination of the herb zone by the dwarf brich [sic] "rise" about 14,000 years ago signals a climatic amelioration (warmer and wetter). It is unlikely that the spread of this more productive vegetation was a factor in late Pleistocene mammalian extinctions.

Location: AEU SCI QE 720 W47, AEA PMA/ASA 560.45 P174
Area: Eastern Beringia, Yukon - northern
Topics: Palynological sites - Hanging Lake, Palynological sites - Lateral Pond, Pollen analysis - Yukon, Vegetation history - Yukon, Faunal remains - Yukon

Ritchie, J. C., and F. K. Hare
1971 Late-Quaternary Vegetation and Climate near the Arctic Tree Line of Northwestern North America. Quaternary Research 1:331-342.

Earlier studies in Alaska and northwest Canada have shown inconsistent evidence for the expected northward extension of the Arctic tree line during the Hypsithermal Interval. Only megafossil evidence has supported this suggestion; the palynological findings have been inconclusive. The Tuktoyaktuk Peninsula, in the Northwest Territories of Canada, offers critical sites for studies of late-Pleistocene ecology, because of its geological, biotic, and climatological features. Palynological and megafossil evidence is presented from sites on the Tuktoyaktuk Peninsula, indicating northward advance of the Arctic tree line during the period 8500-5500 B.P. Relative pollen frequencies of a core of lake sediment suggest a late-Pleistocene sequence as follows: 12,900-11,600 dwarf birch tundra; 11,600-8500 forest tundra; 8500-5500 closed-crown spruce-birch forest; 5500-4000 tall shrub tundra; 4000-present dwarf birch heath tundra. These results suggest that during the Hypsithermal Interval the Arctic Front (July position) was further north, over the Beaufort Sea, a displacement from its present position of about 350 km. The Tuktoyaktuk Peninsula, presently occupied by tundra, and dominated by the Arctic airstream in July, was apparently under forest, with warm, moist Pacific air during the Hypsithermal Interval.

Location: AEU SCI QE 696 Q24
Area: Eastern Beringia, Northwest Territories
Topics: Climate reconstruction, Pollen records, Treeline fluctuations - arctic, Palynological sites - Tuktoyaktuk 5, Plant macrofossils - *Picea*, Pollen analysis, Climate history, Vegetation history

Ritchie, J. C., and S. P. Harrison
1993 Vegetation, Lake Levels, and Climate in Western Canada During the Holocene. In *Global Climates Since the Last Glacial Maximum*, edited by H. E. Wright Jr., J. E. Kutzbach, T. Webb III, W. F. Ruddiman, F. A. Street-Perrott and P. J. Bartlein, pp. 401-414. University of Minnesota Press, Minneapolis, Minnesota.

Area: Eastern Beringia, Canada - western, Yukon, Northwest Territories - western
Topics: Review of vegetation history - Canada, Lake level changes, Review of pollen records - Canada, Climate reconstruction, Treeline fluctuations - boreal forest

Ritchie, J. C., and R. Spear
1982 Late-Pleistocene and Holocene Pollen Stratigraphy of the Mackenzie Region of N.W. Canada. In *AMQUA, 7th Biennial Meeting, Seattle, Washington, Program and Abstracts*, p. 157.

Location: AEU HSS QE 696 A5212
Area: Eastern Beringia, Northwest Territories
Topics: Palynological sites - Sleet Lake, Palynological sites - Tuktoyaktuk 5, Palynological sites - Maria Lake, Palynological sites - Twin Tamarack Lake, Pollen analysis, Plant macrofossils - *Picea*, Vegetation history

Schmidt, R. A. M.

1963 Pleistocene Marine Microfauna in the Bootlegger Cove Clay, Anchorage, Alaska. Science 141:350-351.

Ostracods and Foraminifera, associated with molluscs, indicate a marine depositional environment for part of the Bootlegger Cove Clay. The definite Arctic and North Atlantic affinities of the microfauna suggest a possible migration through the Bering-Chukchi seaway during the late Pleistocene.

Location: AEU SCI Q 1 S41
Area: Eastern Beringia, Alaska - southern
Topics: Foraminifera, Dating - uranium series, Stratigraphy, Plant macrofossils - peat, Ostracodes, Molluscs - marine

Schweger, C. E.

1976 *Late Quaternary Paleoecology of the Onion Portage Region, Northwestern Alaska.* Unpublished Ph.D. dissertation. Department of Geology, University of Alberta, Edmonton, Alberta. xi + 183 pp.

The Onion Portage region of the Kobuk River Valley, northeastern [sic] Alaska, lies within a broad forest-tundra mosaic or ecotone. Here a number of typically boreal species reach their western limits. Many of the forest stands are dominated by deciduous species, *Populus balsamifera*, *P. tremuloides* and *Betula papyrifera*. The diverse topography influences the vegetation pattern since it controls climatic and edaphic factors that interact in a series of complex interrelationships. Permafrost depth seems to be one of the most important environmental factors.

This region was greatly affected by late Quaternary glaciations. The Kobuk Glaciation (early Wisconsin) and the Ambler Stade of the Itkillik Glaciation (late Wisconsin) had frontal positions within the central Kobuk Valley. The stratigraphic history of the Epiguruk exposure indicates periods of extensive alluviation dated greater than 40,000 years ago and from 24,000 to 17,700 B.P. These correlate with the Kobuk Glaciation and Ambler Stade. Organic rich sediments at Epiguruk represent the mid-Wisconsin interstadial; they have yielded a fossil pollen record dominated by grass, sedge and *Artemisia*. This record indicates a steppe-tundra vegetation and a cold, arid climate. Between 17,700 and 10,000 years B.P. downcutting brought the river to very near its present level.

Late glacial-Holocene sections from Epiguruk were examined for fossil pollen content. These data indicate that an open, high arctic tundra existed in the region from about 12,000 to 10,000 years ago at which time birch shrubs invaded. By about 7,000 B.P. alder appeared resulting in a vegetation similar to that now present across the Alaskan north slope. Spruce finally arrived in this region 5,500 B.P. and has since spread, resulting in the modern forest-tundra vegetation. This pollen record indicates an initial cold and possibly arid climate that gave way in the early to mid Holocene to a warmer, moister climate. No climatic reversals are observed in this record.

Excavations at the Onion Portage archaeological site revealed additional paleoenvironmental data. Changes in paleosol type, cryoturbation and plant macrofossils indicate that tundra vegetation and a shallow permafrost table changed to boreal vegetation and deeper permafrost levels. This change occurred about 5,600 years B.P. and corroborates the pollen records.

This paleoecological record compares closely to other published studies revealing a picture of Alaskan vegetation development during the Holocene. However, these data indicate that paleoclimatic inferences are difficult and often confusing.

The Onion Portage archaeological record can be successfully compared to this paleoecological record. In this way culture history reveals human adaptations to a changing arctic environment.

Location: AEU SP COLL 76-42D
Area: Alaska - northwestern, Eastern Beringia
Topics: Archaeological sites - Onion Portage, Geoarchaeology, Palynological sites - Epiguruk, Glacial history - Alaska, Stratigraphy, Vegetation history - Alaska, Pollen analysis - Alaska, Plant macrofossils, Insect macrofossils, Climate history - Alaska, Beringian vegetation, Periglacial features

1981 Chronology of Late Glacial Events from the Tangle Lakes, Alaska Range, Alaska. Arctic Anthropology 18(1):97-101.

This discussion seeks to clarify some aspects of Tangle Lakes region chronology. Study of two sedimentary sections along Rock Creek near Long Tangle Lake provides new data on glacial events in the upper Delta River valley, Alaska. Although definitive interpretation of Denali Complex archaeological remains in this region is not yet possible, new radiocarbon dates and pollen analyses furnish further information on their paleoecological setting.

Location: AEU PMC GN 1 A68
Area: Eastern Beringia, Alaska - southern
Topics: Archaeological sites, Geoarchaeology, Palynological sites - Rock Creek, Glacial lake sequences - Long Tangle Lake, Glacial history - Alaska, Glacial geomorphology, Stratigraphy, Plant macrofossils - *Populus*, Pollen analysis - Alaska, Vegetation history - Alaska

1982 Late Pleistocene Vegetation of Eastern Beringia: Pollen Analysis of Dated Alluvium. In *Paleoecology of Beringia*, edited by D. M. Hopkins, J. V. Matthews Jr., C. E. Schweger and S. B. Young, pp. 95-112. Academic Press, New York, New York.

Dated geological sections, exposed along river valleys of eastern Beringia (Alaska-Yukon), have yielded late Pleistocene geological and paleoecological records. Pollen analyses of five of these sections are presented as relative percentage diagrams. Epiguruk, Kobuk River, Alaska, provides pollen records representing lowland and upland vegetation. These records dominated by Cyperaceae, Gramineae, and *Artemisia* indicate a birch-shrub tundra during the middle Wisconsin, Itkillik/Walker Lake nonglacial interval. Three sections in the Koyukuk River valley, Alaska, have also yielded pollen profiles. Section EIII represents part of either the early Wisconsin Itkillik Glaciation or the middle Wisconsin nonglacial interval. Sections EII and EIV date from 29,000 to 13,000 years BP, clearly spanning the late Pleistocene Walker Lake Glaciation. The three pollen records are dominated by Cyperaceae, include lesser amounts of Gramineae and *Artemisia*, and display a large variety of herbs. These records indicate a sedge-dominated tundra vegetation with local *Salix* stands. The minor elements strongly suggest meadow-type vegetation. It is concluded that these pollen records represent a variety of floodplain communities. They compare favorably to modern floodplain surface samples from Banks Island, arctic Canada; the comparison indicates the extent to which alluvial pollen records represent the local pollen component.

Beringian vegetation was a complex mosaic reflecting a number of biotic and abiotic factors, water and elevation being the two most important influences. Pollen records suggest a vegetation continuum from lowland-mesic and wet-meadow floodplain vegetation to fell field at higher elevations, extending upslope to polar-desert vegetation. The Pleistocene herbifauna probably relied heavily upon the higher production values of floodplain vegetation.

Location: AEU SCI QE 720 W47, AEA PMA/ASA 560.45 P174
Area: Eastern Beringia, Alaska - central, Alaska - western
Topics: Palynological sites - Epiguruk, Palynological sites - Koyukuk River, Pollen analysis, Vegetation history, Stratigraphy, Glacial history, Pollen analysis - modern pollen spectra, Beringian vegetation

Schweger, C., and T. Habgood

1976 The Late Pleistocene Steppe-Tundra of Beringia - A Critique. In *AMQUA, 4th Biennial Meeting, Tempe, Arizona, Abstracts*, pp. 80-81.

Area: Beringia, Alaska, Yukon
Topics: Palynological sites - Koyukuk River, Beringian ecology, Pollen analysis, Faunal remains

Schweger, C. E., and J. A. P. Janssens

1980 Paleoecology of the Boutellier Nonglacial Interval, St. Elias Mountains, Yukon Territory, Canada. Arctic and Alpine Research 12:309-317.

Alluvial, organic-rich sediments associated with the mid-Wisconsin Boutellier nonglacial interval (38,000 to 30,000 BP), St. Elias Mountains, Yukon Territory, yielded fossil pollen and bryophytes. Twenty-five pollen taxa were identified; Cyperaceae, Gramineae, and *Artemisia* dominated the pollen assemblages. Arboreal pollen was rare, while *Salix* was the only common shrub. Of the fossil bryophytes *Drepanocladus brevifolius* was the most common; *Calliergon giganteum* and *Scorpidium scorpioides* were less frequent and less well preserved.

The pollen record suggests a tundra meadow-tundra steppe mosaic with local willow groves. The bryophytes indicate an unweathered minerotrophic substrate. Comparisons with other dated mid-Wisconsin pollen localities of Alaska and Yukon suggest that the Boutellier pollen samples represent the upper zone of an altitudinal vegetational sequence similar to that of the present, but displaced downslope.

Location: AEU SCI G 1 A68
Area: Eastern Beringia, Yukon - southwestern
Topics: Pollen analysis - Yukon, Vegetation history - Yukon, Plant macrofossils - bryophytes, Palynological sites - Silver Creek

Schweger, C. E., and J. V. Matthews Jr.

1984 Mid-Wisconsinan Climatic History for Alaska-Yukon as Revealed by Old Crow Tephra. In *AMQUA, 8th Biennial Meeting, Boulder, Colorado, Program and Abstracts*, p. 113.

Area: Eastern Beringia
Topics: Beringian land bridge connection, Tephra - Sheep Creek, Tephra - Little Timber, Palynological sites - Imuruk Lake, Palynological sites - Twelvemile Bluff, Palynological sites - Koyukuk River, Tephra - Old Crow, Pollen records, Vegetation history, Climate history

1985 Early and Middle Wisconsinan Environments of Eastern Beringia: Stratigraphic and Paleoecological Implications of the Old Crow Tephra. Géographie physique et Quaternaire 39:275-290.

The widespread Beringian Old Crow tephra occurs in Imuruk Lake (Alaska) core V, above the Blake paleomagnetic event and below Radiocarbon [sic] dates, which provide an extrapolated tephra age between 87 000 - 105 000 BP. Exposure KY-11 (Alaska), where the tephra occurs in a dated lacustrine sequence, provides corroboration. Fossil pollen records show the O.C.T. was deposited across northern Beringia on birch-shrub tundra vegetation during an interval of colder climate. A series of climatic oscillations followed tephra deposition. A prolonged period of cold-arid climate (=marine isotope Stage 4) preceded an interval of warmer than present climate starting *ca.* 60 000 BP (beginning Stage 3). During this interval, designated the Koy-Yukon thermal event, an exposed Bering land bridge promoted an interglacial type climate that led to significant biotic changes and permafrost degradation. O.C.T. occurs on drift of the Mirror Creek Glaciation which is equivalent to other presumed Early Wisconsinan glaciations in Alaska and Yukon. These glaciations could not have occurred later than marine Stage 5. Stage 4 was fully as cold as Stage 2 (Late Wisconsinan), yet seems not to have been a time of extensive glaciation. The Middle Wisconsinan, 30 000 to more than 80 000 BP, was a nonglacial interval with several climate fluctuations, one of which, the Koy-Yukon thermal event, was warmer than at present.

Location: AEU SCI G 1 R452
Area: Eastern Beringia
Topics: Tephra - Old Crow, Palynological sites - Imuruk Lake, Palynological sites - Koyukuk River, Palynological sites - Twelvemile Bluff, Review of vegetation history - Eastern Beringia, Review of pollen analyses - Eastern Beringia, Palaeomagnetism, Loess, Periglacial features - fossil ice wedges, Insect macrofossils, Dating - TL, Palynological sites - Old Crow, Plant macrofossils, Tephra - dating, Climate history, Review of glacial history - Eastern Beringia

1991 The Last (Koy-Yukon) Interglaciation in the Yukon: Comparisons with Holocene and Interstadial Pollen Records. Quaternary International 10-12:85-94.

Paleoclimatic reconstructions for the last interglacial (LIG), isotope substage 5e, have achieved new importance for testing climate model simulations and predicting the outcome of global warming. LIG deposits at Ch'ijee's Bluff, northern Yukon, display high fossil spruce pollen frequencies, extralimital species and a lack of interglacial permafrost; all evidence of a warmer than present climate at the site. Comparisons between the Ch'ijee's Bluff LIG pollen record and Late glacial-Holocene pollen stratigraphy demonstrates a high degree of similarity that implies similar patterns and rates of species migration and refugia. Compared to Mid and Early Wisconsinan pollen stratigraphy, the climate of the Wisconsinan

interstades was not as warm as that of the LIG, or today's. LIG warmth was insufficient for the spread of pine into northern Yukon. Alder, so important in the northern forests now, appears to have had a less important role during the LIG, perhaps indicating less widespread permafrost and paludification. Fossiliferous deposits beneath Hungry Creek till (Hughes *et al.*, 1981) are reassigned to the LIG.

Location: AEU SCI QE 696 Q229
Area: Eastern Beringia, Yukon, Alaska, Northwest Territories - western
Topics: Pollen analysis, Insect macrofossils - beetles, Vegetation history, Review of pollen analyses - Yukon, Plant macrofossils, Periglacial features - fossil ice wedges, Palynological sites - Ch'ijee's Bluff, Palynological sites - Koyukuk River, Palynological sites - Bear River, Tephra - Old Crow, Dating - fission track, Tephra - Sheep Creek

Schwert, D. P., and A. C. Ashworth
1982 A Model for the Postglacial Development of the Arctic-Subarctic Beetle (Coleoptera) Fauna of North America. In *AMQUA, 7th Biennial Meeting, Seattle, Washington, Program and Abstracts*, p. 161.

Location: AEU HSS QE 696 A5212
Area: Alaska, Yukon, Eastern Beringia
Topics: Zoogeography - insects, Insect macrofossils - beetles, Refugia

Short, S. K., J. T. Andrews, S. A. Baker, W. N. Mode, and P. J. Webber
1982 Modern and Fossil Pollen Studies, Alaska Haul Road. In *AMQUA, 7th Biennial Meeting, Seattle, Washington, Program and Abstracts*, p. 162.

Location: AEU HSS QE 696 A5212
Area: Eastern Beringia, Alaska - central
Topics: Pollen analysis - modern pollen spectra, Peat cores, Palynological sites - Grayling Lake, Palynological sites - Toolik Upland Bog, Pollen analysis - multivariate statistics, Pollen analysis - Alaska, Vegetation history - Alaska

Short, S. K., S. A. Elias, C. F. Waythomas, and N. E. Williams
1992 Fossil Pollen and Insect Evidence for Postglacial Environmental Conditions, Nushagak and Holitna Lowland Regions, Southwest Alaska. Arctic 45:381-392.

This paper discusses the results of pollen and insect analyses of postglacial samples from the Nushagak and Holitna lowlands, southwest Alaska. Although radiocarbon dating control is poor, the samples can be arranged in a relative-age sequence based on stratigraphic occurrence. The fossil pollen data record the regional transition from a late-glacial dry graminoid tundra through the postglacial Birch, Alder, and Spruce zones. The lack of xeric insect species in the early postglacial suggests that the lowlands of southwest Alaska experienced maritime climatic conditions, in contrast to the interior. Rapid climatic warming is subsequently indicated by the fossil insect data, although the arrival of alder in the region postdates 8500 yr BP. There is no evidence for coniferous forest in the Nushagak lowland at any time in the postglacial, although spruce arrived in the Holitna lowland in the mid-postglacial.

Location: AEU SCI G 600 A67
Area: Eastern Beringia, Alaska - southwestern
Topics: Pollen analysis - modern pollen spectra, Plant macrofossils - peat, Climate history - Alaska, Insect macrofossils, Pollen analysis - Alaska, Vegetation history - Alaska, Stratigraphy

Sirkin, L., and S. J. Tuthill
1987 Late Pleistocene and Holocene Deglaciation and Environments of the Southern Chugach Mountains, Alaska. Geological Society of America Bulletin 99:376-384.

The description of late Pleistocene and Holocene deglaciation and environments in the Copper River-Chugach Mountains region is based on surficial geology as well as on pollen analysis and radiocarbon dating of core samples. The results of this study indicate that late Pleistocene glaciers extended well beyond the present coastal plain. Deglaciation began in the lower Copper River valley prior to 14,000 yr B.P. and in the Bremner and Tasnuna River valleys about 10,000 and 9000 yr B.P., respectively. Cirque glaciers formed marginal moraines at an elevation of ~560 m in the Tasnuna Valley ~8800 yr B.P. On the basis of the pollen record, shrub-herb tundra characterized the initial late wisconsinan [sic] vegetation. Tundra was succeeded first by alder-dominated vegetation and then by spruce forest. The late-glacial pollen zones indicate a time-transgressive colonization of the river valleys and mountain slopes inland from the coast.

Location: AEU SCI QE 1 G341
Area: Eastern Beringia, Alaska - southern
Topics: Palynological sites - Tiekel Bog, Palynological sites - Copper-1 Bog, Palynological sites - Bremner Bog, Palynological sites - Tashuna-1 Bog, Peat cores, Pollen analysis - Alaska, Vegetation history - Alaska, Glacial history - Alaska, Glacial geomorphology - meltwater channels, Glacial geomorphology

Swain, F. M.

1961 Ostracoda from the Pleistocene Gubik Formation, Arctic Coastal Plain, Alaska. In *Proceedings of the First International Symposium on Arctic Geology*, edited by G. O. Raasch, pp. 600-606. University of Toronto Press, Toronto, Ontario.

Ostracoda were obtained from drill cores and shot hole tests in the Quaternary Gubik formation at several localities in northern Alaska. At and immediately south of Barrow the ostracodes of Gubik are predominantly marine, neritic, cold-water types, but at four horizons fresh-water or nearshore types occur. In the Simpson core test no. 1 on the east side of Dease Inlet, the Gubik ostracodes are neritic species; the same is true of core tests on the west side of Smith Bay, shot holes in the Teshekpuk Lake area (with a few fresh-water exceptions), in shot holes on Fish Creek south of Harrison Bay, and in the Sentinental [sic] Hill core test no. 1 on Colville River, near lat. 70° N.

The Gubik ostracodes of the Oumalik core test no. 2, west of Oumalik River, and in shot holes near Ikpikpuk River all are fresh, standing-water types.

The main shoreline during Gubik time based on these few observations, evidently lay roughly parallel to the present coast and thirty to fifty miles inland from a position south of Ocean Point, on Colville River northwestward, south of, but near, Teshekpuk Lake, south of Dease Inlet and a little south of Barrow.

Illustrations of, and brief remarks concerning, the ostracode species are provided.

Notes: Symposium held in Calgary, Alberta, 1960.
Location: AEU SCI QE 70 I62
Area: Eastern Beringia, Alaska - northern
Topics: Ostracodes, Sea level changes, Molluscs - marine

Terasmae, J.

1973 Notes on Late Wisconsin and Early Holocene History of Vegetation in Canada. Arctic and Alpine Research 5:201-222.

Nearly all of Canada was covered by the Wisconsin glaciation and most of the country was deglaciated during the time from about 12,000 to 7,000 years ago. The biota generally survived the glaciation south of the ice sheets in North America, in addition to survival in probable refugia along the coasts and in Yukon and the Arctic Islands.

The ice sheets (Laurentide and Cordilleran) completely disturbed the vegetation in Canada. As deglaciation occurred in response to a significant change in climate at the end of the Pleistocene (about 10,000 years ago), recolonization of Canada by vegetation proceeded from the refugia and a northward migration of biota from the southern peripheral region of glaciation. The late glacial episode differed from any subsequent Holocene time episode in terms of the availability of large areas of "raw" soils, the very large volume of meltwater runoff, and the presence of numerous large glacial lakes that at least locally affected the climate.

The main sources of information about late Wisconsin and Holocene vegetation are records of plant macrofossils and fossil pollen and spore assemblages preserved in lake sediments, peat bogs, and alluvial deposits.

Genetic mixing occurred during recolonization when the populations from different refugia met after having been isolated for several thousand years.

The studies of the fossil record are seriously hindered by the lack of basic palynological data (pollen deposition and dispersal in relation to the modern vegetation) and the ecology, phytogeography, and genetics of Canadian vegetation and flora, as well as the relationships between vegetation and climate in particular.

It has been demonstrated clearly that the palynological and paleobotanical studies can provide the necessary information required for construction of paleoclimatological models that can be beneficially used in the study of environmental changes.

Location: AEU SCI G 1 A68
Area: Eastern Beringia, Canada, Yukon, Northwest Territories
Topics: Review of vegetation history - Canada, Refugia, Review of glacial history - Canada, Plant macrofossils - peat, Review of pollen analyses - Canada, Climate history, Palynological sites - Chapman Lake, Palynological sites - Eskimo Lakes

Terasmae, J., and O. L. Hughes

1966 Late-Wisconsinan Chronology and History of Vegetation in the Ogilvie Mountains, Yukon Territory, Canada. The Palaeobotanist 15:235-242.

Studies of Pleistocene geology and history in the western Ogilvie Mountains, bordering on the east of the unglaciated region in Yukon, were made by Hughes who has recognized three major glacial episodes characterized by successive advances and retreats of valley glaciers originating in cirques along the axis of the southern Ogilvie Ranges. Palynological studies and radiocarbon dating have been used to support and confirm the chronology of complex moraine sequence. The youngest of these glacial episodes is believed to have culminated prior to 10,000-12,900 years ago.

The history of late Wisconsinan vegetation in this area, as inferred from palynological and paleobotanical studies, holds special interest because of the postulated survival of plants in the adjacent unglaciated area which provided a potential late-glacial dispersal centre in addition to migrations reaching the area later from the southeast and south. It seems that birch, alder, willow and spruce were among the early pioneers from the western source. A mixing of the western and eastern floral elements after deglaciation is an interesting problem. The magnitude of the postglacial climatic changes appears to have been smaller than in the more southerly regions. At several sites studied, the onset of the permafrost regime has been an important factor in the development of vegetation, because of its influence on both the groundwater conditions and soil development.

Location: AEU SCI QE 901 P153
Area: Eastern Beringia, Yukon - central
Topics: Palynological sites - Chapman Lake, Palynological sites - Gill Lake, Glacial history - Yukon, Pollen analysis - Yukon, Vegetation history - Yukon, Refugia, Plant migration

Vitt, D. H., and D. G. Horton

1978 Plant Survival in Beringia and in Refugia Along the Canadian Rocky Mountains During Pleistocene Glaciation as Suggested by Present Bryophyte Distribution Patterns. In *AMQUA, 5th Biennial Meeting, Edmonton, Alberta, Abstracts*, p. 235.

Location: AEU HSS QE 696 A5212
Area: Eastern Beringia
Topics: Biogeography - bryophytes, Refugia, Beringian vegetation, Vegetation history - bryophytes

Walde, K.

1986 *Pollen Analysis and Taphonomy of Localtity [sic] 15 Alluvial Sediments, Old Crow Basin, Yukon.* Unpublished M.A. dissertation. Department of Anthropology, University of Alberta, Edmonton, Alberta. xii + 114 pages.

The Old Crow Basin, northern Yukon, contains alluvial and lacustrine deposits of pre-Late Wisconsinan provenience. These fossiliferous deposits are accessable [sic] at many bluff exposures along the Old Crow River. A paleoecological assessment was completed on a 27.00m sediment profile from the Locality 15 section on the Old Crow River. Palynological and sedimentological techniques were employed for this assessment. In addition, taphonomic analyses were completed on a number of problems inherent to alluvial palynology. These included, a) a study on the relationship between pollen concentrations, preservation and degradation within various sediment categories, and b) the testing of 8 hypotheses on the relationship between silt content and pollen concentrations of selected taxa.

These analyses permitted valuable insights into the plaeoecological [sic] history of the basin that could not be accomplished by conventional pollen analysis. Data obtained indicate that alluvial palynology can be a viable means by which to conduct paleoecological research.

Pollen data indicate a number of cycles existed within the basin between forest and tundra conditions from Late Illinoian times to ca. 28,000 years ago. The presence of Early Carboniferous spore [sic] in the upper 6.00m of sediment is most suggestive that paleofluvial discharge may have been diverted westward in Alaska from the Richardson Mountains during probable Mid Wisconsinan times. This in turn could be indicative that Laurentide Ice may have blocked the McDougall Pass during this time period. The presence of these spores, if utilized to extrapolate paleofluvial direction, necessitates the re-evaluation of the current hypothesis on regional drainage and glacial history in the region during Mid to Late Wisconsinan times.

Location: AEU SP COLL 86-158
Area: Eastern Beringia, Yukon - northern
Topics: Pollen analysis - Yukon, Vegetation history - Yukon, Stratigraphy, Palaeontological sites - Old Crow

Wang, X., and M. Geurts
1991 Late Quaternary Pollen Records and Vegetation History of the Southwest Yukon Territory: A Review. Géographie physique et Quaternaire 45:175-193.

This paper is a summary of all known late Quaternary palynostratigraphic records from the southwest Yukon Territory. Thirty two pollen sites available by the end of 1988 are reviewed. Most pollen records in the region are of Holocene age. During the late-glacial to early Holocene, the southwest Yukon supported a herb-dominated tundra vegetation which was replaced by a birch-dominated shrub-tundra at about 10,000 yr BP. Spruce invaded the area between 9000 and 8600 yr BP at different localities, and a southward time transgression is visible in the Aishihik Basin. The current regional vegetation has been stable since 7600-8000 yr BP when dense spruce forest and/or spruce forest-tundra was established in most localities. In the Snag area, however, dense spruce forest developed only around 5700 yr BP, which is about 2000 years later than in the Aishihik Basin. The exotic pine pollen records in the region exhibit an interesting pattern, suggesting a frequent shift of the atmospheric circulation system. Anomalous records of alder pollen from the Aishihik Basin and adjacent regions suggest that alder has never been widespread in these areas due to aridity, and alder pollen is greatly overrepresented in pollen spectra. Spruce arrival dates suggest that further investigations in the Tintina Valley, Yukon River Valley, and Carmacks region might provide useful information concerning the spruce migration routes.

Location: AEU SCI G 1 R452
Area: Eastern Beringia, Yukon - southern, Alaska - eastern, Northwest Territories - western
Topics: Palynological sites - Yukon - southern, Lake cores, Peat cores, Tephra - Eastern Beringia, Plant migration, Vegetation history - *Picea*, Vegetation history - *Pinus contorta*, Vegetation history - *Alnus*, Review of pollen analyses - Yukon, Review of vegetation history - Yukon

Wright, J. V.
1985 Prehistoric Cultural Distributions as an Indicator of Environmental Change. In *Climatic Change in Canada 5: Critical Periods in the Quaternary Climatic History of Northern North America*, edited by C. Harington, p. 247. Syllogeus No. 55. National Museums of Canada, Ottawa, Ontario.

Location: AEU SCI QH 1 S985
Area: Canada
Topics: Archaeological cultural maps, Palaeoenvironmental reconstructions

Young, S.

1976 Is Steppe Tundra Alive and Well in Alaska? In *AMQUA, 4th Biennial Meeting, Tempe, Arizona, Abstracts*, pp. 84-88.

Area: Alaska, Beringia
Topics: Refugia, Biogeography, Vegetation history - Alaska, Beringian ecology

PART 4. LATE QUATERNARY PALAEONTOLOGY

Agenbroad, L. D.

1985 The Distribution and Chronology of Mammoth in the New World. Acta Zoologica Fennica 170:221-224.

Published data on the discovery and species identification of mammoth remains in the New World provides a population of approximately 3100 individuals from 1427 localities. Using the species identification provided by the investigators, maps of species frequency and geographic distributions were constructed for *Mammuthus meridionalis*, *Mammuthus imperator*, *Mammuthus columbi* and *Mammuthus primigenius*. Absolute dates provide a time depth of nearly 1.8 million years for mammoth in the Americas. An isochronal map of mammoth dated younger than 15 000 B.P. provides evidence for an extinction model.

Location: AEU POLAR 05 A188
Area: Eastern Beringia
Topics: Faunal remains - *Mammuthus*, Faunal remains - *Mammuthus primigenius*, Faunal remains - *Mammuthus imperator*, Faunal remains - *Mammuthus columbi*, Zoogeography - *Mammuthus*, Palaeontological sites - Eastern Beringia, Faunal extinction

Anderson, E.

1973 Ferret from the Pleistocene of Central Alaska. Journal of Mammalogy 54:778-779.

Location: AEU SCI QL 700 J86
Area: Alaska - central, Eastern Beringia
Topics: Faunal remains - *Mustela*, Zoogeography - *Mustela*, Faunal migration

1977 Pleistocene Mustelidae (Mammalia, Carnivora) from Fairbanks, Alaska. Bulletin of the Museum of Comparative Zoology 148:1-21.

Five species of mustelids, *Mustela* cf. *erminea*, *Mustela vison*, *Mustela eversmanni beringiae* ssp. nov., *Gulo gulo*, and *Taxidea taxus*, are reported from late Pleistocene deposits near Fairbanks, Alaska. This is the first record of the steppe ferret in the New World. It is closely related to, if not conspecific with, *Mustela nigripes*, the black-footed ferret. The northernmost occurrence of *Taxidea taxus* is reported. The wolverine, badger and ferret material is characterized by large size, and some of the specimens are the largest known for the species. The Fairbanks area was never glaciated, and the grassy steppes of this refugium supported a large assemblage of Pleistocene mammals.

Location: AEU SCI QL 1 H33
Area: Alaska - central, Eastern Beringia
Topics: Faunal remains - *Mustela erminea*, Faunal remains - *Mustela vison*, Faunal remains - *Mustela eversmanni*, Faunal remains - *Gulo gulo*, Faunal remains - *Taxidea taxus*, Palaeontological sites - Alaska, Zoogeography - Mustelidae, Refugia, Faunal extinction

Beebe, B. F.

1978 Two Pleistocene Mammal Species from Beringia. In *AMQUA, 5th Biennial Meeting, Edmonton, Alberta, Abstracts*, p. 159.

Location: AEU HSS QE 696 A5212
Area: Yukon - northern, Eastern Beringia
Topics: Palaeontological sites - Old Crow, Faunal remains - *Canis familiaris*, Faunal remains - *Platygonus*, Zoogeography

1980 Pleistocene Peccary, *Platygonus compressus* Le Conte, from Yukon Territory, Canada. Canadian Journal of Earth Sciences 17:1204-1209.

A fragmented radius of a late Pleistocene peccary, *Platygonus compressus* Le Conte, has been recovered near Old Crow, Yukon Territory, Canada. The known northern limit of the species is thus extended approximately 3000 km, from the northeastern United States to north of the Arctic Circle in Pleistocene Beringia, and confirms the cold tolerance of the species. The small size of the specimen supports a theory that small size in *P. compressus* is correlated with periglacial environment. Although the age of the specimen is uncertain, a mid-Wisconsin age is inferred on the basis of availability of a route of dispersal to Beringia and palaeoecological evidence which suggest a largely treeless tundra dominated by sedges and grasses, but with a rich herb component.

Location: AEU SCI QE 1 C212
Area: Yukon - northern, Eastern Beringia
Topics: Palaeontological sites - Old Crow, Faunal remains - *Platygonus compressus*, Zoogeography - *Platygonus*, Faunal migration, Beringian environment, Glacial history - Yukon, Glacial lake sequences, Ice-free corridor

1980 A Domestic Dog (*Canis familiaris* L.) of Probable Pleistocene Age from Old Crow, Yukon Territory, Canada. Canadian Journal of Archaeology No. 4:161-168.

A complete right dentary of a domestic dog, *Canis familiaris* L., recovered from Old Crow Basin, Yukon Territory, Canada, may represent one of the earliest known domestic dogs. The oldest known dog remains have been dated to approximately 12,000 BP. Although the Old Crow specimen has not been radiocarbon-dated, it is inferred to be Pleistocene in age on the basis of its stratigraphic position and staining.

Location: AEU PMC FC 65 C1152
Area: Yukon - northern, Eastern Beringia
Topics: Faunal remains - *Canis familiaris*, Palaeontological sites - Old Crow, Stratigraphy, Faunal remains - *Bison crassicornis*, Molluscs

Choquette, L. P. E., C. R. Harington, and J. Archibald

1975 Paleopathology: Exostoses of the Third Metacarpal in Pleistocene Horses from the Yukon Territory. Canadian Journal of Earth Sciences 12:1053-1058.

Two third metacarpals from extinct Yukon Pleistocene horses display pathological exostoses. One specimen is from the Yukon wild ass (*Equus* (*Asinus*) *lambei*) of probable late Pleistocene age; the other is from a large horse like *Equus* (*Plesippus*) *verae*, which may be of early middle Pleistocene age or somewhat later.

Location: AEU SCI QE 1 C212
Area: Yukon, Eastern Beringia
Topics: Faunal remains - *Equus lambei*, Faunal migration, Palaeontological sites - Gold Run Creek, Palaeontological sites - Old Crow, Palaeontology

Churcher, C. S.

1980 Did the North American Mammoth Migrate? Canadian Journal of Anthropology 1(1):103-105.

Location: AEU PMC GN 1 C22
Area: Eastern Beringia
Topics: Faunal migration, Palaeontological sites - Old Crow, Zoogeography - *Mammuthus*

1986 A Mammoth Measure of Time: Molar Compression in *Mammuthus* from the Old Crow Basin, Yukon Territory, Canada. Current Research in the Pleistocene 3:61-64.

Location: AEU HSS E 61 C97
Area: Yukon - northern, Eastern Beringia

Topics: Palaeontological sites - Old Crow, Dating, Faunal remains - *Mammuthus primigenius*, Faunal remains - *Mammuthus columbi*, Faunal remains - *Mammuthus imperator*, Faunal remains - *Bison*, Faunal remains - *Canis*, Faunal remains - *Rangifer*, Faunal remains - *Bootherium*, Faunal remains - *Arctodus*, Faunal remains - *Saiga tatarica*, Faunal remains - *Bos*, Faunal remains - *Cuon alpinus*, Faunal associations

Churcher, C. S., and M. Wilson

1979 Quaternary Mammals from the Eastern Peace River District, Alberta. Journal of Paleontology 53:71-76.

Six genera and ten species of mammals have been obtained from post-glacial gravels of the eastern Peace River District, Alberta. The gravels are exposed in borrow pits or river bluffs and comprise a post-glacial high mantling sheet north and west of Peace River - and three of four terraces in the valleys of the Smoky and Peace rivers. Gravels older than mid-Wisconsin are recognised at Watino on the Smoky River. Extinct post-glacial taxa are *Mammuthus primigenius*, *Equus* cf. *E. conversidens*, *E.* cf. *E. niobrarensis*, *Bison priscus*, *B. b. occidentalis*, a camelid, possibly *Hemiauchenia* or *Camelops*; extant taxa are *Cervus canadensis*, *Bison b. athabascae*, *B. b. bison*, and *Ovibos* cf. *O. moschatus*. Remains of four genera and five species have been obtained from Sangamon or earlier deposits at Watino on the Smoky River. These represent *Spermophilus* sp., a proboscidean, *Equus* sp. small, *E.* cf. *E. niobrarensis*, and *Bison* sp. Both these faunas may have existed in either a predominantly plains environment or in a aspen-poplar parkland, but not in continuous boreal forest.

Location: AEU SCI QE 701 J86
Area: Alberta - northwestern, Eastern Beringia
Topics: Palaeontological sites - British Columbia - northeastern, Palaeontological sites - Rocky Mountains, Palaeontological sites - Alberta - northwestern, Faunal remains - *Mammuthus*, Faunal remains - *Mammuthus primigenius*, Faunal remains - *Citellus*, Faunal remains - *Equus niobrarensis*, Faunal remains - *Equus conversidens*, Plant macrofossils - wood, Plant macrofossils - peat, Faunal remains - Camelidae, Faunal remains - *Cervus canadensis*, Faunal remains - *Ovibos moschatus*, Faunal remains - *Bison*, Faunal remains - *Equus*, Faunal remains - *Castor canadensis*, Faunal remains - *Mammut americanum*, Faunal remains - *Alces alces*, Faunal remains - *Bison bison occidentalis*, Faunal remains - *Bison priscus*, Glacial history, Glacial lake sequences - Glacial Lake Peace, Zoogeography

Crossman, E. J., and C. R. Harington

1970 Pleistocene Pike, *Esox lucius*, and *Esox* sp., from the Yukon Territory and Ontario. Canadian Journal of Earth Sciences 7:1130-1138.

Two fish dentary fragments from Late Pleistocene deposits in the Old Crow area, Yukon Territory are referable to the northern pike (*Esox lucius*). One tooth fragment from the last interglacial (Sangamon) deposits in the Don River Valley, Toronto, Ontario, is identified as *Esox* sp. The Yukon dentaries are the first fossils definitely attributable to *Esox lucius* in North America, and these records are the first for the suborder Esocoidei in Canada.

Location: AEU SCI QE 1 C212
Area: Yukon, Eastern Beringia
Topics: Faunal remains - *Esox lucius*, Zoogeography - *Esox*, Refugia, Beringian ecology, Faunal remains - *Lepus*, Faunal remains - *Mammuthus primigenius*, Faunal remains - *Equus*, Faunal remains - *Rangifer tarandus*, Faunal remains - *Bison*, Palaeontological sites - Old Crow, Refugia, Faunal remains - fish, Zoogeography - fish, Molluscs - *Anodonta beringiana*

Cumbaa, S. L., D. E. McAllister, and R. E. Morlan

1981 Late Pleistocene Fish Fossils of *Coregonus*, *Stenodus*, *Thymallus*, *Catostomus*, *Lota*, and *Cottus* from the Old Crow Basin, Northern Yukon, Canada. Canadian Journal of Earth Sciences 18:1740-1754.

Fossils of the broad whitefish, *Coregonus nasus*; the inconnu, *Stenodus leucichthys*; the longnose sucker, *Catostomus catostomus*; and the burbot, *Lota lota*, are reported for the first time from North America and a freshwater sculpin, *Cottus*, for the first time from Yukon Territory. The known fossil occurrence of the Arctic grayling, *Thymallus arcticus*, in North America is extended from 32,000 to about 60,000 years BP. These six fossils represent about one sixth of the present-day Yukon freshwater ichthyofauna of 35 species.

The fossils provide a major test for the method of determining glacial refugia based on geographic variation of morphological or protein characters. They confirm that these taxa were present prior to and presumably survived the Wisconsinan glaciation in a Beringian refugium.

The occurrence of these fossils, all subarctic or subarctic-boreal species known at present in the same area, does not suggest a paleoenvironment greatly different from the present one.

Location: AEU SCI QE 1 C212
Area: Yukon - northern, Eastern Beringia
Topics: Palaeontological sites - Old Crow, Faunal remains, Faunal remains - fish, Zoogeography - fish, Stratigraphy, Refugia, Beringian ecology

Dixon, E. J.

1984 Context and Environment in Taphonomic Analysis: Examples from Alaska's Porcupine River Caves. Quaternary Research 22:201-215.

Field investigations of caves along Alaska's Porcupine River document three major mechanisms which modify bone in patterns similar to alterations produced by man: (1) carnivore fracture; (2) rodent gnawing; and (3) rock fall and rubble scarring. A late Wisconsin faunal assemblage composed of *Equus* sp., *Rangifer tarandus*, *Ovis dalli*, *Bison* sp., proboscidean, numerous small mammal species, birds, and fish is well documented. This faunal assemblage suggests a mosaic environment of grassland-tundra-forest in the immediate vicinity of these caves and implies that the late Wisconsin environment in north-central Alaska may have been characterized by a number of microenvironments and colder, dryer, steppe conditions. Taphonomic data which have historically been interpreted to support human occupation of eastern Beringia during the Pleistocene are critically examined and the context of these discoveries (not the specimens themselves) provides the test essential to document the antiquity of man in North America prior to 12,000 yr ago.

Notes: Paper presented at the symposium "Taphonomic Analysis and Interpretation in North American Pleistocene Archaeology" held in Fairbanks, Alaska, April 1982.
Location: AEU SCI QE 696 Q24
Area: Alaska - northeastern, Eastern Beringia
Topics: Faunal remains - *Bison*, Faunal remains - *Equus*, Faunal remains - *Lepus othus*, Faunal remains - *Dicrostonyx*, Faunal remains - *Marmota*, Faunal remains - *Mustela*, Faunal remains - *Spermophilus parryii*, Faunal remains - *Lemmus sibiricus*, Faunal remains - *Lepus americanus*, Faunal remains - *Microtus xanthognathus*, Faunal remains - *Vulpes vulpes*, Faunal remains - *Ursus americanus*, Bone modification, Taphonomy, Stratigraphy, Palaeontological sites - Alaska, Pollen records - Alaska, Loess, Beringian ecology, Human migration

Driver, J. C.

1988 Late Pleistocene and Holocene Vertebrates and Palaeoenvironments from Charlie Lake Cave, Northeast British Columbia. Canadian Journal of Earth Sciences 25:1545-1553.

Excavations outside Charlie Lake Cave, Peace River District, British Columbia, revealed deposits dating from ~10 700 BP to the present. The earliest fauna (10 700 - 10 000 BP) was deposited when the newly deglaciated landscape was largely unforested and included bison (*Bison* sp.), ground squirrel (*Spermophilus* sp.), a large hare (*Lepus* sp.), snowshoe hare (*Lepus americanus*), and a variety of birds, including the Cliff Swallow (*Hirundo pyrrhonota*). By 10 000 BP showshoe hare (*Lepus americanus*) was the most numerous mammal, indicating the development of forested conditions. By 9000 BP the fauna resembled the modern Peace River fauna prior to European settlement, typical of a largely forested landscape, with wetland areas indicated by aquatic avian species. Subsequent Holocene climatic fluctuations are not evident in the faunal record.

Location: AEU SCI QE 1 C212
Area: British Columbia - northeastern, Eastern Beringia
Topics: Archaeological sites - Charlie Lake Cave, Archaeological sites - Rocky Mountains, Palaeontological sites - Rocky Mountains, Geoarchaeology, Faunal remains, Faunal remains - *Lepus americanus*, Faunal remains - *Lepus*, Faunal remains - *Marmota*, Faunal remains - *Spermophilus*, Faunal remains - *Peromyscus*, Faunal remains - *Clethrionomys gapperi*, Faunal remains - *Ondatra zibethicus*, Faunal remains - *Microtus*, Faunal remains - *Microtus xanthognathus*, Faunal remains - *Canis*, Faunal remains - *Mustela nivalis*, Faunal remains - *Bison*, Faunal remains - birds, Faunal remains - fish, Pollen records, Vegetation history

Fitzgerald, G. R.

1978 Pleistocene Grebes from the Old Crow Basin, Yukon Territory. Canadian Journal of Earth Sciences 15:1887-1892.

Four grebe fossils of presumed late Pleistocene age are reported from the Old Crow Basin. They include one Red-necked Grebe (*Podiceps grisegena*), two Horned Grebes (*Podiceps auritus*) and an unidentified grebe (*Podiceps* sp.). Three of the specimens have a minimum age of approximately 10 700 years BP.

Location: AEU SCI QE 1 C212
Area: Yukon - northern, Eastern Beringia
Topics: Palaeontological sites - Old Crow, Faunal remains - birds, Molluscs - *Anodonta beringiana*, Glacial lake sequences, Beringian environment

1980 Pleistocene Loons of the Old Crow Basin, Yukon Territory, Canada. Canadian Journal of Earth Sciences 17:1593-1598.

Ten Pleistocene fossils representing loons of the species *Gavia stellata*, *Gavia arctica*, *Gavia immer*, and *Gavia* cf. *adamsii* are reported from the Old Crow Basin in the northern Yukon Territory, an area which is presently outside the range of *G. adamsii*. One specimen of *G. arctica* is from beds that correlate to beds dating >54 000 years BP and are presumed to be of Sangamon interglacial age. Two specimens of *G. stellata* and one of *G.* cf. *adamsii* have minimum dates of about 10 700 years BP.

Location: AEU SCI QE 1 C212
Area: Yukon - northern, Eastern Beringia
Topics: Palaeontological sites - Old Crow, Faunal remains - birds, Zoogeography - birds, Molluscs - *Anodonta beringiana*, Beringian environment

1991 Pleistocene Ducks of the Old Crow Basin, Yukon Territory, Canada. Canadian Journal of Earth Sciences 28:1561-1571.

Thirteen species of ducks, ranging in age from ?latest Illinoian to Holocene, have been identified from the Old Crow Basin. The most common species in the collection is the Oldsquaw (*Clangula hyemalis*), followed by the White-winged Scoter (*Melanitta fusca*). The genus *Anas* (six species) is well represented. The Ring-necked Duck (*Aythya collaris*) and the Black Scoter (*Melanitta nigra*) also occupied the area in the past. This shows that good habitat for ducks has existed in the area at times since the ?Illinoian and supports environmental reconstructions for the area suggesting that ?Sangamon conditions were as warm as, or warmer than, today, with ponds and streams and pockets of boreal forest. There is also evidence for inland migration of the Common Eider (*Somateria mollissima*).

Location: AEU SCI QE 1 C212
Area: Yukon - northern, Eastern Beringia
Topics: Faunal remains - birds, Stratigraphy, Palaeontological sites - Old Crow, Beringian environment

Forsten, A.

1986 *Equus lambei* Hay, the Yukon Wild Horse, Not Ass. Journal of Mammalogy 67:422-423.

Location: AEU SCI QL 700 J86
Area: Eastern Beringia
Topics: Faunal remains - *Equus lambei*, Palaeontological sites - Gold Run Creek, Palaeontology, Zoogeography - *Equus*

Frick, C.

1930 Alaska's Frozen Fauna. Natural History 30(1):71-80.

Location: AEU SCI QH 1 N28
Area: Alaska, Eastern Beringia
Topics: Faunal remains - *Mammonteus primigenius*, Faunal remains - *Mastodon americanus*, Faunal remains - *Bison crassicornis*, Faunal remains - *Felis atrox*, Faunal remains - *Equus alaskae*, Faunal remains - *Symbos tyrelli*, Faunal remains - *Bootherium sargenti*, Faunal remains - *Camelops*, Faunal remains - *Arctodus simus*, Faunal remains - *Aenocyon dirus*

Guilday, J. E.

1963 Pleistocene Zoogeography of the Lemming, *Dicrostonyx*. Evolution 17:194-197.

Location: AEU SCI QH 301 E93
Area: Eastern Beringia
Topics: Zoogeography - *Dicrostonyx*, Faunal remains - *Dicrostonyx*

Guthrie, R. D.

1966 The Extinct Wapiti of Alaska and Yukon Territory. Canadian Journal of Zoology 44:47-57.

A population of wapiti existed in the northern part of North America during the Wisconsin glaciation, but became extinct at its close, probably as a result of vegetational changes. They were large antlered forms, with a comparatively high frequency of supernumerary proximal tines. The chronology and nature of the Alaskan fossil wapiti are discussed in relation to the historical zoogeography and competition with other ungulates in North America during the Late Pleistocene.

Location: AEU SCI QL 1 C21
Area: Alaska, Yukon, Eastern Beringia
Topics: Refugia, Faunal migration, Palaeontological sites - Eastern Beringia, Palaeontological sites - Lost Chicken Creek, Faunal remains - *Cervus*, Zoogeography - *Cervus*, Faunal extinction, Beringian environment

1966 Pelage of Fossil Bison - A New Osteological Index. Journal of Mammalogy 47:725-727.

Location: AEU SCI QL 700 J86
Area: Eastern Beringia
Topics: Palaeontology, Faunal migration, Zoogeography - *Bison*, Faunal remains - *Bison*

1967 Differential Preservation and Recovery of Pleistocene Large Mammal Remains in Alaska. Journal of Paleontology 41:243-246.

From the thousands of large mammal fossils recovered from placer mining operations in Alaska it is apparent that the probability of recovery is not the same for each skeletal element. Two major factors seem to determine this probability - the size of the element and its composition.

Location: AEU SCI QE 701 J86
Area: Alaska, Eastern Beringia
Topics: Palaeontological sites - Alaska, Faunal remains - *Equus caballus*, Faunal remains - *Bison*, Faunal remains - *Ovibos*, Faunal remains - *Alces*, Faunal remains - *Rangifer*, Taphonomy

1968 Paleoecology of a Late Pleistocene Small Mammal Community from Interior Alaska. Arctic 21:223-244.

Fossil small mammals from late Pleistocene sediments in interior Alaska were used to investigate the paleoecology of the region. The predominant member of the fossil assemblage was *Microtus gregalis* indicating that the area was above tree line and occupied by a fauna and flora which preferred well-drained soils. Three species were found as fossils which are not in the area today: *Microtus gregalis*, *Citellus undulatus*, and *Dicrostonyx torquatus*. Their extinction in interior Alaska appears to be due to a rapid reduction of the preferred habitat at the end of the Wisconsin glaciation. The ecological interpretation of the paleocommunity and its extinction is consistent with interpretations from fossil large mammal assemblages from the same area.

Location: AEU SCI G 600 A67
Area: Alaska - central, Eastern Beringia
Topics: Zoogeography - microtine rodents, Faunal remains - *Microtus gregalis*, Faunal remains - *Citellus undulatus*, Faunal remains - *Dicrostonyx torquatus*, Faunal remains - *Lemmus sibiricus*, Faunal remains - *Microtus xanthognathus*, Faunal remains - *Bison*, Plant macrofossils, Beringian environment, Palaeontological sites - Alaska, Stratigraphy, Tephra - Alaska, Faunal extinction

1968 Paleoecology of the Large-Mammal Community in Interior Alaska During the Late Pleistocene. The American Midland Naturalist 79(2):346-363.

This study of the paleoecology of four fossil assemblages of large mammals from the late Pleistocene sediments near Fairbanks, Alaska, emphasizes the structure, composition, habitat, and the pattern of subsequent extinction of the community. All four faunas were composed predominantly of grazers. Bison, horse, and mammoth were the most common species. Many component species of this complex community of large mammals became extinct near the close of the Wisconsin glaciation, leaving the comparatively depauperate community that exists in Alaska today. The high percentage of grazers in the fossil community suggests that interior Alaska was a grassland environment during the late Pleistocene.

Location: AEU SCI QH 1 A51
Area: Alaska - central, Eastern Beringia
Topics: Palaeontological sites - Alaska, Faunal remains - *Elephas primigenius*, Faunal remains - *Mammuthus primigenius*, Faunal remains - *Bison*, Faunal remains - *Equus caballus*, Faunal remains - *Rangifer tarandus*, Faunal remains - *Ovibos moschatus*, Faunal remains - *Alces*, Faunal remains - *Cervus*, Faunal remains - *Ovis*, Faunal remains - *Cervalces*, Faunal remains - *Canis lupus*, Faunal remains - *Canis latrans*, Faunal remains - *Felis*, Faunal remains - *Symbos*, Faunal remains - *Bootherium*, Faunal remains - *Saiga tatarica*, Faunal remains - *Camelops*, Faunal remains - *Bos*, Faunal remains - *Mastodon americanus*, Faunal remains - *Ursus arctos*, Faunal remains - *Smilodon*, Beringian vegetation, Climate history - Alaska, Faunal extinction, Refugia, Megafauna

1970 Bison Evolution and Zoogeography in North America During the Pleistocene. The Quarterly Review of Biology 45:1-15.

The fossil record and information about contemporary forms provide evidence that the evolutionary pattern of bison cannot be interpreted as either a unidirectional decrease in horn size or as a series of successive invasions to the New World from the Old. Rather, some species have persisted and remained relatively unchanged for long periods of time, while elsewhere other contemporaneous species were changing quite rapidly. Although the trends in the evolution of bison horn size have been remarkably regular, major reversals have taken place.

Bison arose in Eurasia and have had a much longer history there than in North America. In spite of this longer history in the Old World, bison have undergone greater evolutionary changes in North America. This can be explained by a different mode and intensity of competition in the New World.

The major points presented are the following: (1) The giant-horned *B. latifrons* was a New World product. (2) *B. priscus* (= *B. crassicornus*) appeared early as a holarctic northern species and remained in that niche until the late Wisconsin (Würm). (3) Most of the other bison species in the late Pleistocene were derived indirectly or directly from this widespread northern species. (4) Middle and Late Pleistocene bison can be placed into four species: *B. priscus*, which can be dated at least as far back as early mid-Pleistocene; *B. latifrons*, which extends back at least to late Illinoian (Riss) time (it is possible the *B. latifrons* gave rise to *B. antiquus*; if so the species *B. alleni* should be maintained); *B. antiquus*, which originated during the early to middle part of the Wisconsin (Würm) glaciation; and *B. bison*, which was a late Wisconsin product. (5) *B. latifrons* became extinct, at least over most of its range, in pre-Wisconsin time. *B. priscus* and *B. antiquus* became extinct in the late Wisconsin, and *B. bison* still exists in relict populations. (6) Two or more species of bison have not occurred sympatrically for extended periods of time. (7) Neither the "orthogenetic" nor the "wave" theory adequately accounts for the evolution of bison in North America; rather, the fossils can only be explained by a combination of invasions from Siberia and evolutionary changes that occurred in the new environment.

Location: AEU SCI QH 301 Q1
Area: Eastern Beringia
Topics: Zoogeography - *Bison*, Faunal migration, Palaeontology, Faunal remains - *Bison*, Faunal associations

1973 Mummified Pika (*Ochotona*) Carcass and Dung Pellets from Pleistocene Deposits in Interior Alaska. Journal of Mammalogy 54:970-971.

Location: AEU SCI QL 700 J86
Area: Alaska - central, Eastern Beringia
Topics: Faunal remains - *Ochotona collaris*, Stratigraphy, Zoogeography - *Ochotona*, Refugia

1980 Bison and Man in North America. Canadian Journal of Anthropology 1(1):55-73.

Rapid evolutionary changes in bison morphology and the frequent occurrence of bison in archaeological sites make them particularly important in North American Quaternary studies. Major morphological trends in bison evolution are discussed in an update of bison paleogeography, and a conceptual model is proposed to account for the changes in bison evolution. Central to this picture is the steppe bison, *B. priscus*, which dominated the Holarctic throughout the last half of the Pleistocene. It was used as a food item in Eurasia and Beringia but was not the major prey species. In North America, however, bison became the staple meat resource at the end of the last glacial. The increasing density of bison resulted from vegetational change and the extinction of competitor species. Seasonality of available resources was critical in bison adaptations and numbers, which in turn affected the modes of human bison hunting and human density in North America.

Location: AEU PMC GN 1 C22
Area: Eastern Beringia, Western Beringia
Topics: Faunal remains - *Bison*, Zoogeography - *Bison*, Faunal migration

1984 Alaskan Megabucks, Megabulls, and Megarams: The Issue of Pleistocene Gigantism. In *Special Publication of Carnegie Museum of Natural History No. 8*, edited by H. H. Genoways and M. R. Dawson, pp. 482-510. Trustees of Carnegie Institute, Pittsburgh, Pennsylvania.

Pleistocene large mammals from Alaska appear to be larger than their living counterparts. This seems to be the case for cervids (*Rangifer*, *Cervus*, and *Alces*) and bovids (*Ovis*, *Ovibos*, and *Bison*). The circumstances of this larger body size are examined and it is concluded that the primary reason behind such large bodied, large horned or antlered, individuals was two-fold (1) they belonged to populations which were kept understocked by high winter mortality and (2) experienced a long peak in nutrient availability during the growth season. The length of this seasonal peak in nutrient availability is seen as critical to studies of body size changes. Wild sheep are used as an exemplary case and are examined in greater detail than other species.

Large non-ruminant ungulates seem to respond differently than ruminants to the changing conditions from mid-Pleistocene, to late Pleistocene, through the Holocene. This may be due to their more conservative life histories. Pleistocene ground squirrels (*Spermophilus*) in Alaska seem to have responded differently than ungulates in their body size changes. Their special life history features, particularly hibernation and reproduction may account for this difference.

Location: AEU SCI QE 741 C76
Area: Alaska, Eastern Beringia
Topics: Beringian ecology, Megafauna, Zoogeography, Faunal extinction

1988 Bone Litter from an Alaskan Pleistocene Carnivore Den. Current Research in the Pleistocene 5:69-71.

Location: AEA PMA/ASA
Area: Alaska - central, Eastern Beringia
Topics: Molluscs - *Succinea*, Faunal remains - *Mammuthus primigenius*, Faunal remains - *Rangifer tarandus*, Faunal remains - *Bison priscus*, Faunal remains - *Equus*, Faunal remains - *Gulo gulo*

1992 New Paleoecological and Paleoethological Information on the Extinct Helmeted Muskoxen from Alaska. Annales Zoologici Fennici 28:175-186.

A newly discovered horn sheath is described for the extinct helmeted muskox, *Bootherium*. This is the first complete female horn sheath described for that species. The sheath was fitted to a *Bootherium* skull, revealing a very different form than exhibited by those of living muskox, *Ovibos*, and suggests a different behavioral emphasis in its use. Also, plant remains from ingested food and from possible faecal samples were examined histologically to reconstruct diet of *Bootherium*. These suggest a slightly different diet than that of *Ovibos*.

Location: AEU SCI QL 1 A53
Area: Alaska, Eastern Beringia
Topics: Faunal remains - *Bootherium*, Beringian vegetation, Beringian ecology, Megafauna, Faunal extinction, Palaeontology

Guthrie, R. D., and A. Greenwalt

1988 Saw Marks on Pleistocene Megafaunal Remains from Alaska. Current Research in the Pleistocene 5:109-111.

Location: AEA PMA/ASA
Area: Alaska, Eastern Beringia
Topics: Bone modification, Faunal remains - *Mammuthus primigenius*, Taphonomy

Guthrie, R. D., and J. V. Matthews Jr.

1971 The Cape Deceit Fauna - Early Pleistocene Mammalian Assemblages from the Alaskan Arctic. Quaternary Research 1:474-510.

Pleistocene exposures located near Cape Deceit on the south shore of Kotzebue Sound (Alaska) contain a complex sequence of organic sediments which have yielded fossil vertebrates of taxonomic, evolutionary, and zoogeographic significance. Cape Deceit Local Fauna from the Cape Deceit Formation, lowermost of three major stratigraphic units recognized at the site, contains representatives of the genera *Canis*, *Rangifer*, *Cervus*, *Ochotona*, *Lemmus*, *Microtus*, *Pliomys*, and a newly described genus and species, *Predicrostonyx hopkinsi* - predecessor of the extant genus *Dicrostonyx*. In addition to *P. hopkinsi*, new species of *Ochotona*, *Pliomys*, and *Microtus* are described from the Cape Deceit Local Fauna. The stage of evolution of *Microtus deceitensis* sp. n. and *P. hopkinsi* sp. n. indicate that the Cape Deceit Formation is at least of pre-Cromerian age. This assumption is substantiated by the stratigraphy of the overlying Inmachuk and Deering formations, fossils from these units (including *Dicrostonyx torquatus* and *D. henseli*), and C-14 dates. The

Cape Deceit Local Fauna, therefore, contains the earliest North American record of several of the included genera in addition to the only North American record of *Pliomys*.

Stratigraphic features at the exposure indicate that the Cape Deceit Local Fauna mammals lived in a treeless (tundra) environment showing that the contemporary tundra mammalian fauna has a lengthy arctic-adapted evolutionary history. We postulate the existence in northeastern Eurasia and Alaska of a Pleistocene-Recent "Beringian" mammalian realm which has at times contributed to the fauna of more southern regions of the Palaearctic and Nearctic. The fact that this southern movement of arctic-adapted or arctic-derived Beringian mammals occurred at different times in Europe and North America (interpreted by some as indicating the existence of a "Beringian filter-bridge") is, we think, due largely to differences of continental physiography and Pleistocene geography south of the Beringian area.

Notes: Contains extensive faunal lists.
Location: AEU SCI QE 696 Q24
Area: Alaska - northwestern, Eastern Beringia
Topics: Stratigraphy, Periglacial features - fossil ice wedges, Faunal remains - Alaska, Palaeontological sites - Cape Deceit, Plant macrofossils - wood, Plant macrofossils - peat, Insect macrofossils, Ostracodes, Molluscs, Faunal associations, Beringian environment, Zoogeography, Faunal migration

Guthrie, R. D., and S. Stoker
1990 Paleoecological Significance of Mummified Remains of Pleistocene Horses from the North Slope of the Brooks Range, Alaska. Arctic 43:267-274.

Radiocarbon dates from horse fossils found on the North Slope of Alaska show that horses did live there during the last peak glacial (Duvanny Yar Interval, Marine Isotope Stage 2). Some previous paleoecological studies have assumed the regions's climate was too extreme for large mammals during the Duvanny Yar. Hoof structure suggests the Pleistocene horses survived on winter range characterized by low snowfall and/or snow removal by wind. Hoof growth rate suggests a substantial dietary volume of exposed dead grass during winter; hoof wear pattern indicates the horses were able to remain relatively sedentary, requiring neither long-distance winter migration nor constant digging through snow for food. Bones with mummified soft tissue may have been buried and preserved by wind-drifted eolian silt.

Location: AEU SCI G 600 A67
Area: Alaska - northern, Eastern Beringia
Topics: Faunal remains - *Equus*, Palaeontological sites - Alaska, Palaeontological sites - Siberia - eastern, Beringian vegetation, Stratigraphy, Loess

Hamilton, T. D., G. M. Ashley, K. M. Reed, and C. E. Schweger
1993 Late Pleistocene Vertebrates and Other Fossils from Epiguruk, Northwestern Alaska. Quaternary Research 39:381-389.

Sediments exposed at Epiguruk, a large cutbank on the Kobuk River about 170 km inland from Kotzebue Sound, record multiple episodes of glacial-age alluviation followed by interstadial downcutting and formation of paleosols. Vertebrate remains from Epiguruk include mammoth, bison, caribou, an equid, a canid, arctic ground squirrel, lemmings, and voles. Radiocarbon ages of bone validated by concordant ages of peat and wood span the interval between about 37,000 and 14,000 yr B.P. The late Pleistocene pollen record is dominated by Cyperaceae, with *Artemisia*, *Salix*, *Betula*, and *Gramineae* also generally abundant. The fossil record from Epiguruk indicates that the Kobuk River valley supported tundra vegetation with abundant riparian willows during middle and late Wisconsin time. Large herbivores were present during the height of late Wisconsin glaciation as well as during its waning stage and the preceding interstadial interval. The Kobuk River valley would have been a favourable refugium for plants, animals, and possibly humans throughout the last glaciation.

Location: AEU SCI QE 696 Q24
Area: Alaska - northwestern, Eastern Beringia
Topics: Stratigraphy, Glacial history - Alaska, Palaeosols, Faunal remains - *Mammuthus primigenius*, Faunal remains - *Spermophilus parryii*, Faunal remains - *Dicrostonyx torquatus*, Faunal remains - *Lemmus sibiricus*, Faunal remains - *Rangifer*, Faunal remains - *Equus*, Faunal remains - *Canis*, Faunal remains -

Bison, Faunal remains - *Microtus*, Plant macrofossils - peat, Plant macrofossils - wood, Plant macrofossils - *Salix*, Pollen analysis - Alaska, Vegetation history - Alaska, Ostracodes, Refugia, Palaeontological sites - Alaska

Hamilton, T. D., and J. L. Bischoff

1984 Uranium-Series Dating of Fossil Bones from the Canyon Creek Vertebrate Locality in Central Alaska. In *The United States Geological Survey in Alaska: Accomplishments During 1982*, edited by K. M. Reed and S. Bartsch-Winkler, pp. 26-29. Circular 939. United States Geological Survey.

Location: AEU SCI QE 75 C57
Area: Alaska - central
Topics: Palaeontological sites - Canyon Creek, Stratigraphy, Tephra - Alaska, Dating - uranium series, Faunal remains - *Mammuthus*, Faunal remains - *Equus*, Climate history, Glacial history, Loess

Harington, C. R.

1969 Pleistocene Remains of the Lion-Like Cat (*Panthera atrox*) from the Yukon Territory and Northern Alaska. Canadian Journal of Earth Sciences 6:1277-1288.

Skull and forelimb fragments of the large, extinct cat (*Panthera atrox*) from Pleistocene sediments in the Dawson area, Yukon Territory, are the first records of the species for Canada. A further specimen from the Kaolak River, near the arctic coast of Alaska, significantly extends the known northward range of this cat. The species has been reported from approximately 26 localities from Alaska to Peru, and may have migrated from Eurasia just prior to the Sangamon interglacial. Data reviewed suggest that *Panthera atrox* from North America, the Eurasian "cave lion" *Panthera leo spelaea*, and the large Chinese cat *Panthera youngi* are conspecific.

Location: AEU SCI QE 1 C212
Area: Yukon, Alaska, Eastern Beringia
Topics: Faunal remains - *Panthera atrox*, Zoogeography - *Panthera*, Faunal migration, Palaeontological sites - Eastern Beringia, Faunal remains - *Canis*, Faunal remains - *Mammuthus primigenius*, Faunal remains - *Equus*, Faunal remains - *Rangifer tarandus*, Faunal remains - *Bison crassicornis*, Faunal remains - *Spermophilus undulatus*, Faunal remains - *Alces alces*, Refugia

1970 Ice Age Mammal Research in the Yukon Territory and Alaska. In *Early Man and Environments in Northwest North America*, edited by R. A. Smith and J. W. Smith, pp. 35-51. University of Calgary Archaeological Association, Calgary, Alberta.

Location: AEU HSS E 77.8 E12
Area: Eastern Beringia, Yukon, Alaska
Topics: Palaeontological sites - Eastern Beringia, Palaeontological sites - Old Crow, Stratigraphy, Faunal remains - Ochotonidae, Faunal remains - *Lepus*, Faunal remains - *Castor canadensis*, Faunal remains - *Castoroides ohioensis*, Faunal remains - *Ondatra zibethicus*, Faunal remains - *Microtus gregalis*, Faunal remains - *Cuon*, Faunal remains - *Alopex lagopus*, Faunal remains - *Gulo*, Faunal remains - *Panthera atrox*, Faunal remains - *Homotherium*, Faunal remains - *Mammut americanum*, Faunal remains - *Mammuthus primigenius*, Faunal remains - *Equus*, Faunal remains - *Camelops hesternus*, Faunal remains - *Alces alces*, Faunal remains - *Rangifer tarandus*, Faunal remains - *Bison crassicornis*, Faunal remains - *Bison alaskensis*, Faunal remains - *Arctodus simus*, Faunal remains - *Taxidea taxus*, Faunal remains - *Ovibos moschatus*, Faunal remains - *Symbos cavifrons*, Faunal remains - *Equus lambei*, Faunal remains - *Canis lupus*, Faunal remains - *Spermophilus undulatus*, Faunal remains - *Alces alces*, Faunal remains - *Megalonyx*

1971 Ice Age Mammals in Canada. The Arctic Circular 21:66-89.

Notes: Contains extensive faunal lists.
Location: AEU SCI G 600 A674
Area: Eastern Beringia, British Columbia, Yukon, Northwest Territories
Topics: Refugia, Faunal remains, Palaeontological sites - Eastern Beringia, Palaeontological sites - Old Crow, Faunal migration, Sea level changes, Glacial history, Faunal extinction

1977 *Pleistocene Mammals of the Yukon Territory.* Unpublished Ph.D. dissertation. Department of Zoology, University of Alberta, Edmonton, Alberta. lxxi + 1060 pages.

This study is based on a selection of specimens from a collection of approximately 14,000 Pleistocene vertebrate fossils made from 1966 to 1975. Most of the ice age mammal material described has come from the Dawson and Old Crow areas in the Yukon Territory. The latter area appears to be the most productive for Pleistocene vertebrate remains in Canada.

Ten orders, 19 families, 44 genera and 64 species of mammals have been identified from Yukon Pleistocene deposits. Among the families, Cricetidae, Mustelidae, Equidae and Bovidae are most strongly represented. Horse, mammoth, bison, caribou, muskrat, ground squirrel, brown lemming and pika remains are the commonest in the collection. Approximately 40% of the species which occupied the Yukon during the ice age are extinct, and about 60% no longer occur in the region.

Early Pleistocene (e.g. plains shrew (*?Planisorex* cf. *dixonensis*), giant pika (*Ochotona* cf. *whartoni*) and southern mammoth (*Mammuthus* cf. *meridionalis*)); middle Pleistocene (e.g. Soergel's muskox (*Soergelia* cf. *elisabethae*), Staudinger's muskox (*Praeovibos priscus*), giant moose (*Alces latifrons*), steppe mammoth (*Mammuthus* cf. *armeniacus*), and large horses (*Equus* cf. (*Plesippus*) *verae*)); and late Pleistocene (e.g. Yukon wild ass (*Equus* (*Asinus*) *lambei*), moose (*Alces alces*), tundra muskox (*Ovibos moschatus*), arctic fox (*Alopex lagopus*), Dall sheep (*Ovis ?dalli*), and western bison (*Bison bison occidentalis*)) mammal remains are recognized in the Yukon Pleistocene fauna.

A large number of direct radiocarbon dates indicate that the following species occupied the Eastern Beringian refugium from approximately 30,000 to 10,000 years ago: ground squirrel (*Spermophilus parryi*), American lion (*Panthera leo atrox*), woolly mammoth (*Mammuthus primigenius*), Yukon wild ass (*Equus* (*Asinus*) *lambei*), western camel (*Camelops* sp.), caribou (*Rangifer tarandus*), large-horned bison (*Bison crassicornis*), Sargent's muskox (*Boötherium sargenti*), helmeted muskox (*Symbos cavifrons*) and Dall sheep (*Ovis ?dalli*). A caribou tibia fleshing tool made by man yielded a radiocarbon date of 27,000 $\pm^{3000}_{2000}$ years B.P.

Two basic components comprise the Yukon ice age mammal fauna. An estimated 75% of the species (mainly cold-adapted) were derived from Eurasia or Beringia, while 25% (mainly dry, scrub grassland species) seem to have been derived from southern North America. The first group reached the Yukon chiefly by the Bering Isthmus during glacial maxima; the second group entered mainly by the "western corridor" along the eastern margin of the Cordillera.

Analysis of habitat information on 52 of the mammal species represented in the Yukon collection suggest the following preferences: grassland (33%), tundra (20%), forest (17%), parkland (16%), water (11%), alpine (3%).

Detailed studies based largely on fossil pollen, plant macrofossils, molluscs, ostracodes, and vertebrates at sites of ?Sangamon (> 54,000 years B.P.), and mid-Wisconsin (32,400 ± 770 years B.P.) age have provided interesting glimpses into Pleistocene paleoenvironments in the Yukon Territory.

Notes: Thesis is bound in two volumes; the first volume ends at p. 454.
Location: AEU SP COLL 77F-31D
Area: Yukon, Eastern Beringia
Topics: Faunal remains - Eastern Beringia, Palaeontological sites - Yukon, Palaeontological sites - Old Crow, Bone modification, Faunal migration, Beringian environment, Plant macrofossils, Pollen records - Eastern Beringia, Molluscs, Ostracodes, Faunal remains - *Equus*, Faunal remains - *Alces alces*, Faunal remains - *Ovibos moschatus*, Faunal remains - *Alopex lagopus*, Faunal remains - *Ovis dalli*, Faunal remains - *Bison bison occidentalis*, Faunal remains - *Panthera leo atrox*, Faunal remains - *Mammuthus primigenius*, Faunal remains - *Camelops*, Faunal remains - *Rangifer tarandus*, Faunal remains - *Bison crassicornis*, Faunal remains - *Symbos cavifrons*, Faunal remains - *Bootherium sargenti*, Faunal remains - *Spermophilus parryii*

1978 Faunal Exchanges between Siberia and North America - Evidence from Quaternary Land Mammal Remains in Siberia, Alaska and the Yukon Territory. In *AMQUA, 5th Biennial Meeting, Edmonton, Alberta, Abstracts*, pp. 56-77.

Location: AEU HSS QE 696 A5212
Area: Eastern Beringia, Western Beringia, Siberia, Alaska, Yukon
Topics: Faunal migration, Palaeontological sites - Eastern Beringia, Palaeontological sites - Western Beringia, Palaeontological sites - Old Crow, Palaeontological sites - Cape Deceit, Zoogeography, Faunal remains - *Bison alaskensis*, Faunal remains - *Alces latifrons*, Faunal remains - *Cervalces alaskensis*, Faunal remains - *Sorex*, Faunal remains - *Megalonyx*, Faunal remains - *Castor*, Faunal remains - *Clethrionomys*, Faunal remains - *Erethizon*, Faunal remains - *Arctodus*, Faunal remains - *Taxidea*, Faunal remains - *Lynx*, Faunal remains - *Mammut*, Faunal remains - *Camelops*, Faunal remains - *Bos*, Faunal remains - *Symbos*, Faunal remains - *Bootherium*, Faunal remains - *Ovis*, Faunal remains - *Mammuthus primigenius*, Faunal remains - *Bison bison occidentalis*

1978 *Quaternary Vertebrate Faunas of Canada and Alaska and their Suggested Chronological Sequence.* Syllogeus No. 15. National Museums of Canada, Ottawa, Ontario. 105 pp.

Thirty-one Canadian and Alaskan Quaternary vertebrate faunas, ranging in age from about 1,800,000 to 5,000 years, are reviewed against a background of some of the major characteristics of the ice age in northern North America, and an attempt is made to outline their chronological sequence. For each fauna a list of species is given, and the following points are dealt with where possible: suggested geological age, stratigraphy at the site, palaeoenvironmental implications, and pertinent references. Where interest seems to warrant it, single species or specimens are discussed. Radiocarbon dates on bone from Pleistocene vertebrates or from associated organic material are included.

In conclusion, significant features of the faunas are reviewed from oldest to youngest and in relation to several faunas of similar age from northeastern Siberia and the Great Plains of the United States. Early man is mentioned briefly. Evidence suggests that people were present in the northern Yukon about 27,000 years ago, and perhaps even earlier than 32,000 years ago in southern Alberta.

Notes: A comprehensive detailed review with extensive faunal lists.
Location: AEU SCI QH 1 S985
Area: British Columbia, Yukon, Northwest Territories, Alaska, Siberia - northeastern, Eastern Beringia, Western Beringia
Topics: Faunal remains, Palaeontological sites - Eastern Beringia, Palaeontological sites - Western Beringia, Stratigraphy, Human migration, Faunal migration, Palaeontological sites - Cape Deceit, Palaeontological sites - Old Crow, Palaeontological sites - Gold Run Creek, Palaeontological sites - Lost Chicken Creek, Glacial history

1980 Radiocarbon Dates on some Quaternary Mammals and Artifacts from Northern North America. Arctic 33:815-832.

Nine radiocarbon dates on five genera of Quaternary mammals from northern North America are discussed. Of particular interest are: (a) a 29,000-year-old artifact from the Yukon Territory; (b) the first evidence that steppe mammoths (*Mammuthus columbi* or *M. armeniacus*) occupied eastern Beringia during the peak of the Wisconsin glaciation; (c) dates indicating that saiga antelopes (*Saiga tatarica*) and Yukon short-faced bears (*Arctodus simus yukonensis*) occupied the Yukon-Alaska region in mid-Wisconsin time; (d) dates indicating that bison (*Bison* sp.) lived near the arctic coast of the Northwest Territories, and tundra muskoxen (*Ovibos moschatus*) lived in the western Yukon in late postglacial time; and (e) dates suggesting that tundra muskoxen have occupied the central Canadian Arctic Islands for the last 7000 years.

Location: AEU SCI G 600 A67
Area: Yukon, Alaska, Northwest Territories, Eastern Beringia
Topics: Palaeontological sites - Eastern Beringia, Palaeontological sites - Baillie Islands, Bone modification, Faunal remains - *Mammuthus*, Faunal remains - *Arctodus simus*, Faunal remains - *Saiga tatarica*,

Faunal remains - *Bison*, Faunal remains - *Mammuthus primigenius*, Faunal remains - *Ovibos moschatus*, Faunal migration, Palaeontological sites - Western Beringia, Refugia, Palaeontological sites - Old Crow

1980 Pleistocene Mammals from Lost Chicken Creek, Alaska. Canadian Journal of Earth Sciences 17:168-198.

Ten species of Pleistocene mammals are represented in a collection of fossils from a placer mining site at Lost Chicken Creek. Among these are four extinct species, an extinct subspecies, two species now extinct in the region, and three species that still occupy the area. *Bison crassicornis* (large-horned bison), *Equus (Asinus) lambei* (Yukon wild ass), and *Rangifer tarandus* (caribou) remains are commonest. *Equus (Asinus)* cf. *kiang* (kiang-like wild ass) is recorded for the first time from Alaska.

These mammals seem to have occupied a cool steppe-like grassland during late Wisconsin time. Bones of horse, wapiti, bison, and helmeted muskox (*Symbos*) have yielded radiocarbon dates between 27 000 and 10 000 years BP. The dated bison bone was modified by man, indicating that people were present, and probably hunting and butchering bison, in easternmost Alaska at the close of the Wisconsin glaciation.

Location: AEU SCI QE 1 C212
Area: Alaska - eastern, Eastern Beringia
Topics: Palaeontological sites - Alaska, Palaeontological sites - Lost Chicken Creek, Taphonomy, Stratigraphy, Faunal remains - *Symbos cavifrons*, Faunal remains - *Bison crassicornis*, Faunal remains - *Cervus elaphus*, Faunal remains - *Panthera leo atrox*, Faunal remains - *Mammuthus primigenius*, Faunal remains - *Equus lambei*, Faunal remains - *Equus kiang*, Faunal remains - *Rangifer tarandus*, Faunal remains - *Ovis dalli*, Faunal remains - *Gulo gulo*, Faunal remains - *Spermophilus parryii*, Beringian vegetation, Bone modification, Human migration, Faunal migration

1981 Pleistocene Saiga Antelopes in North America and their Paleoenvironmental Implications. In *Quaternary Paleoclimate*, edited by W. C. Mahaney, pp. 193-225. Geo Abstracts, Norwich, England.

Six fossils from central Alaska, one from northern Alaska and one from east of the Mackenzie Delta in Canada are referred to the Saiga antelope (*Saiga tatarica*). This species seems to have dispersed from Eurasia as far westward as England, and as far eastward as northwestern Canada, during the late Pleistocene. The species became extinct in western Europe and North America toward the close of the last (Würm/Wisconsin) Glaciation, but survives in central Eurasia. Because living saigas are particularly adapted to dry steppe-grasslands, it is likely that they crossed broad, steppe-like plains of the northern Bering Isthmus during glacial phases of the late Pleistocene. Presumably the kind of northern steppe to which they had adapted once extended eastward, up the Yukon River valley to central Alaska, and along the Arctic Coastal Plain to Baillie Islands in Canada. Saiga antelope remains appear to be useful paleoenvironmental indicators. They suggest the presence of steppe-like vegetation, generally low, flattish terrain, rather arid climatic conditions and above all, shallow snow cover.

Location: AEU SCI QC 884 Q25
Area: Eastern Beringia, Western Beringia
Topics: Faunal remains - *Saiga tatarica*, Palaeontological sites - Baillie Islands, Palaeontological sites - Eastern Beringia, Zoogeography - *Saiga tatarica*, Palaeontological sites - Western Beringia, Beringian ecology, Faunal migration, Pollen records, Climate history

1984 Quaternary Marine and Land Mammals and their Paleoenvironmental Implications - Some Examples from Northern North America. In *Special Publication of Carnegie Museum of Natural History No. 8*, edited by H. H. Genoways and M. R. Dawson, pp. 511-525. Trustees of Carnegie Institute, Pittsburgh, Pennsylvania.

Workers on Quaternary mammals should try to obtain as much information as possible from fossil evidence available - especially from well-preserved specimens. Examples discussed here are drawn from marine (seal and walrus) and land mammal remains (mammoth, stag-moose, saiga antelope, and arctic ground squirrel) from northern North America.

It is particularly important that: specimens are correctly identified; stratigraphic and sedimentological situations of skeletons found in place are carefully assessed; associated plant and animal remains are evaluated for paleoenvironmental clues; direct and indirect geochronological data applying to the specimens are gathered - where possible testing the validity of such data by cross-checking; bone surfaces are closely examined so that signs of predator-prey relationships, scavenging, and disease may be detected; an effort is made to establish individual ages of the specimens (for example, by tooth-sectioning); in the case of unusually well-preserved specimens, stomach contents, droppings and soft parts are analyzed in order to gain information on feeding habits and other ecological parameters.

Above all, Quaternary paleobiologists should view these long-dead animals as realistically as possible, trying to see their place in the web of life - as mammalogists view living species. Finally, we must try to pass on significant paleoenvironmental information in an appealing way to the public - they should be aware of the great changes that can occur in landscapes and their biota over even relatively short periods of geological time.

Location: AEU SCI QE 741 C76
Area: Northwest Territories, British Columbia, Yukon, Eastern Beringia
Topics: Palaeontological sites - Baillie Islands, Palaeontological sites - Eastern Beringia, Faunal remains - *Saiga tatarica*, Faunal remains - *Spermophilus parryii*, Faunal remains - *Odobenus rosmarus*, Faunal remains - *Mammuthus columbi*, Palynological sites - Yukon, Vegetation history, Plant macrofossils, Diatoms

1985 Comments on Canadian Pleistocene Mammals. Acta Zoologica Fennica 170:193-197.

The most productive Pleistocene mammal localities occur around the margin of the relatively barren, formerly heavily glaciated Precambrian Shield. The most significant land mammal sites occur in the Prairies and unglaciated parts of the Yukon. In Saskatchewan, the Wellsh Valley site has yielded our best evidence of an early Pleistocene fauna. An impressive sequence of mammalian remains, extending from middle Pleistocene to the present, is exposed at Medicine Hat, Alberta. The richest known sites in Canada are the Dawson and Old Crow areas of the Yukon. Dawson localities have produced unusually well-preserved specimens of late Wisconsin age, which are generally exposed in the course of placer mining for gold. In contrast, bones exposed by the winding Old Crow River tend to be more poorly preserved, but represent a greater variety of species. Canada is bounded by three oceans, Atlantic, Pacific and Arctic, a fact that is obvious when marine mammal remains are considered. Of particular interest in this regard are recently discovered walrus skeletons found in place near Qualicum Beach, Vancouver Island and Moncton, New Brunswick. They indicate the more southerly distribution of this species during early and late Wisconsin time, respectively. In future, I suggest that a systematic paleontological testing of Canadian caves would be valuable. Other important Pleistocene mammal sites may be found in the western Canadian Arctic Islands, particularly Banks Island.

Location: AEU POLAR 05 A188
Area: Eastern Beringia, Yukon, British Columbia - southwestern
Topics: Palaeontological sites - Old Crow, Palaeontological sites - Eastern Beringia, Palaeontological sites - British Columbia, Archaeological sites - Bluefish Caves, Stratigraphy, Faunal remains, Faunal remains - *Odobenus rosmarus*

1986 Ice Age Animals and Early Man in the Old Crow Region, Yukon. In *Living Explorers of the Canadian Arctic*, edited by S. Milligan and W. Kupsch, pp. 27-39. Outcrop, Yellowknife, Northwest Territories.

Location: AEU HSS FC 3956 L875
Area: Yukon - northern, Eastern Beringia
Topics: Palaeontological sites - Old Crow, Stratigraphy, Faunal remains - Yukon, Faunal remains - fish, Faunal remains - birds, Tephra - Old Crow, Molluscs - *Anodonta beringiana*, Bone modification, Lithics

1989 Pleistocene Vertebrate Localities in the Yukon. In *Late Cenozoic History of the Interior Basins of Alaska and the Yukon*, edited by L. D. Carter, T. D. Hamilton and J. P. Galloway, pp. 93-98. Circular 1026. United States Geological Survey.

Notes: Contains extensive faunal lists.
Location: AEU SCI QE 75 C57
Area: Yukon, Eastern Beringia
Topics: Palaeontological sites - Yukon, Palaeontological sites - Old Crow, Palaeontological sites - Gold Run Creek, Archaeological sites - Bluefish Caves, Faunal remains - Yukon, Bone modification

1990 Vertebrates of the Last Interglaciation in Canada: A Review with New Data. Géographie physique et Quaternaire 44:375-387.

Vertebrate fossils and faunas that are reasonably inferred to be of last (Sangamonian) interglacial age are considered in geographic order from east to west to north in Canada. Data on localities, vertebrate taxa, stratigraphy, geochronology, paleoenvironment and paleoclimate are considered. Information on key faunas from Toronto, Fort Qu'Appelle, Saskatoon, Medicine Hat and Old Crow River is supplemented by data on smaller faunas and, in some cases, individual specimens. New data are included for several localities. Fishes, such as whitefish (*Coregonus* sp.) and pike (*Esox* sp.), had broad distributions from eastern to northwestern Canada. Except for a turtle (*Emydoidea blandingi*) from Innerkip, Ontario, amphibians and reptiles have not yet been reported from Canada during the Sangamon Interglaciation. Several species of grouse-like birds (Tetranidae) are known from western Canada. Among the mammals, American mastodons (*Mammut americanum*), mammoths (*Mammuthus* sp.), beavers (*Castor canadensis*), giant beavers (*Castoroides ohioensis*), muskrats (*Ondatra zibethicus*), voles (*Microtus* sp.), white-tailed deer (*Odocoileus virginianus*), stag moose (*Cervalces* sp.), bison [perhaps mainly giant bison (*Bison latifrons*)] and muskoxen (Ovibovini) were evidently most widespread during the last interglacial interval. The western plains had a characteristic large mammal fauna that included Columbian mammoths (*Mammuthus columbi*), Scott's horses (*Equus scotti*), small horses (*Equus conversidens*), western camels (*Camelops hesternus*), pronghorns (Antilocapridae), giant bison (*Bison latifrons*) and helmeted muskoxen (*Symbos cavifrons*).

Notes: Contains extensive faunal lists.
Location: AEU SCI G 1 R452
Area: Yukon - northern, Northwest Territories, Eastern Beringia
Topics: Palaeontological sites - Eastern Beringia, Palaeontological sites - Old Crow, Stratigraphy, Plant macrofossils - *Picea*, Plant macrofossils - *Larix*, Climate history, Pollen records, Vegetation history, Faunal remains, Zoogeography

1990 Ice Age Vertebrates in the Canadian Arctic Islands. In *Canada's Missing Dimension: Science and History in the Canadian Arctic Islands, Volume 1*, edited by C. R. Harington, pp. 140-160. Canadian Museum of Nature, Ottawa, Ontario.

Remains of Pleistocene (about 2 million to 10,000 years ago) vertebrates are rarely found in the Canadian Arctic Islands. From earliest to latest they include: a few fossils of middle Pleistocene interglacial (perhaps 700,000 years old) tundra-adapted animals from southern Banks Island; small seal, large whale, small horse and bison from last interglacial (or earlier) deposits near the Beaufort Sea coast; a mammoth and tundra muskox of possible early Wisconsin age from Garry Island in the same region; a middle Wisconsin Dovekie from southern Ellesmere Island and a tundra muskox of that age (or older) from Banks Island; as well as several species (e.g. mammoth, small horse, saiga antelope and tundra muskox) from late Wisconsin deposits of the western islands (Melville, Banks, Baillie and Herschel).

Early Holocene (about 10,000 to 5,000 years ago) vertebrates from the Arctic Islands are more commonly found and include: Oldsquaw duck, ringed seal, walrus, narwhal, bowhead whale, Peary caribou and tundra muskox. Many Holocene mammal (mainly marine mammal) remains have been collected from raised beaches in the archipelago during the past decade. Radiocarbon dates on these specimens indicate relatively warm (open water) conditions about 9,000 and 4,000 years ago.

Location: AEU SCI FC 4195 A73 C213
Area: Yukon - northern, Northwest Territories, Eastern Beringia
Topics: Palaeontological sites - Baillie Islands, Faunal remains - *Dicrostonyx torquatus*, Faunal remains - *Lagopus*, Faunal remains - *Equus lambei*, Faunal remains - *Bison priscus*, Faunal remains - *Ovibos moschatus*, Faunal remains - *Mammuthus primigenius*, Faunal remains - birds, Faunal remains - *Saiga tatarica*, Faunal remains - *Symbos cavifrons*, Faunal remains - *Rangifer tarandus*

Harington, C. R., and F. V. Clulow
1973 Pleistocene Mammals from Gold Run Creek, Yukon Territory. Canadian Journal of Earth Sciences 10:697-759.

Remains of thirteen species of mammals are reported from Pleistocene deposits at Gold Run Creek near Dawson, Yukon Territory. Eight of the thirteen species are extinct and two are no longer living in the Yukon. The most common elements of the fauna are *Equus* (*Asinus*) *lambei* (Yukon wild ass), and *Bison crassicornis* (large-horned bison). *Taxidea* (badger) and *Bison alaskensis* (Alaskan bison) are reported for the first time from the Yukon Pleistocene. A kiang-like horse is also reported from deposits at Gold Run Creek.

These mammals may have inhabited a cool grassland or open parkland during late Wisconsin time. *Bison crassicornis* and mammoth bone from deposits at Gold Run Creek have yielded radiocarbon dates of 22 200 ± 1400 yr B.P. and 32 250 ± 1750 yr B.P. respectively. *Bison alaskensis* is evidently older than the remainder of the fauna as bone from the specimen yielded a radiocarbon date of over 39 900 yr B.P.

Location: AEU SCI QE 1 C212
Area: Yukon, Eastern Beringia
Topics: Palaeontological sites - Yukon, Stratigraphy, Faunal remains - *Canis lupus*, Faunal remains - *Arctodus simus*, Faunal remains - *Taxidea taxus*, Faunal remains - *Panthera leo atrox*, Faunal remains - *Mammut americanum*, Faunal remains - *Mammuthus primigenius*, Faunal remains - *Equus lambei*, Faunal remains - *Equus kiang*, Faunal remains - *Alces alces*, Faunal remains - *Rangifer tarandus*, Faunal remains - *Bison alaskensis*, Faunal remains - *Bison crassicornis*, Faunal remains - *Bootherium*, Beringian vegetation, Palaeontological sites - Gold Run Creek, Refugia

Harington, C. R., H. W. Tipper, and R. J. Mott
1974 Mammoth from Babine Lake, British Columbia. Canadian Journal of Earth Sciences 11:285-303.

Remains of a partially articulate mammoth skeleton were exposed during stripping operations at a mining site on Babine Lake, central British Columbia. The bones lay in silty pond deposits in a bedrock depression, and were overlain by a thin layer of gravel and a thick layer of glacial till. Although no molar teeth were found, limb proportions show that the specimen was a large mammoth, like the Columbian mammoth (*Mammuthus* cf. *M. columbi*). Two radiocarbon dates of 42 900 ± 1860 yr B.P. and 43 800 ± 1830 yr B.P. on wood from the silty fossiliferous layer, and another of 34 000 ± 690 yr B.P. on mammoth bone suggest that the animal sank in sticky pond deposits and died there. Paleobotanical evidence indicates that, during this part of the Olympia Interglaciation, the vegetation near Babine Lake was similar to present shrub tundra just beyond the treeline in northern Canada.

Location: AEU SCI QE 1 C212
Area: British Columbia, Eastern Beringia
Topics: Faunal remains - *Mammuthus columbi*, Stratigraphy, Plant macrofossils - *Picea*, Plant macrofossils - *Abies*, Zoogeography - *Mammuthus*, Palaeontological sites - British Columbia, Megafauna, Pollen records, Beringian environment

Hillerud, J. M.
1980 Bison as Indicators of Geologic Age. Canadian Journal of Anthropology 1(1):77-80.

Location: AEU PMC GN 1 C22
Topics: Faunal remains - *Bison*, Zoogeography - *Bison*

Jackson Jr., L. E., and R. Harington

1991 Middle Wisconsinan Mammals, Stratigraphy, and Sedimentology at the Ketza River Site, Yukon Territory. Géographie physique et Quaternaire 45:69-77.

Remains of Middle Wisconsinan mammoth, bison, horse, moose, hare, ground squirrel and lemming were recovered from sediments that stratigraphically underlie till of the Late Wisconsinan McConnell Glaciation along the Ketza River valley. The bone-bearing sediments are a complex of colluvium, fan, and outwash sediments. Similar fossil sites are likely to occur where glaciofluvial watercourses abut hillside deposits laid down prior to the onset of McConnell Glaciation.

Location: AEU SCI G 1 R452
Area: Yukon - southeastern, Eastern Beringia
Topics: Faunal remains - *Lepus*, Faunal remains - *Dicrostonyx torquatus*, Faunal remains - *Mammuthus*, Faunal remains - *Equus lambei*, Faunal remains - *Alces*, Faunal remains - *Bison priscus*, Faunal remains - *Spermophilus parryii*, Stratigraphy, Sedimentology, Palaeontological sites - Eastern Beringia

Kurtén, B., and E. Anderson

1980 *Pleistocene Mammals of North America*. Columbia University Press, New York, New York. xviii + 442 pp.

Location: AEU SCI QE 881 K963
Topics: Megafauna, Faunal remains, Palaeontology, Zoogeography, Faunal migration, Faunal extinction, Faunal associations, Palaeontological sites - Eastern Beringia, Palaeontological sites - Western Beringia

Lindsey, C. C.

1978 Aquatic Zoogeography and the Ice-Free Corridor. In *AMQUA, 5th Biennial Meeting, Edmonton, Alberta, Abstracts*, pp. 31-34.

Location: AEU HSS QE 696 A5212
Area: Yukon, Northwest Territories, Eastern Beringia
Topics: Faunal remains - fish, Zoogeography - zooplankton, Zoogeography - fish, Refugia, Ice-free corridor, Glacial lake sequences

McAllister, D. E., and C. R. Harington

1969 Pleistocene Grayling, *Thymallus*, from Yukon, Canada. Canadian Journal of Earth Sciences 6:1185-1190.

Eleven cycloid fish scales or scale fragments with scalloped anterior margins were obtained from a Pleistocene deposit in the Old Crow area, Yukon Territory. Shells from the same horizon as the scales were radiocarbon dated at 32 400 ± 770 yr B.P. The scales are from the Arctic grayling, *Thymallus arcticus*, providing the first fossil records of the genus and of the subfamily Thymallinae for North America.

Location: AEU SCI QE 1 C212
Area: Yukon - northern, Eastern Beringia
Topics: Faunal remains - *Thymallus arcticus*, Zoogeography - fish, Insect macrofossils - beetles, Molluscs - *Pisidium idahoense*, Ostracodes, Faunal remains - *Lemmus sibiricus*, Plant macrofossils - wood, Plant macrofossils - *Draba* seeds, Plant macrofossils - *Potamogeton* seeds, Plant macrofossils - *Najas* seed, Plant macrofossils - *Potentilla* seeds, Plant macrofossils - needles, Plant macrofossils - Cruciferae seeds, Plant macrofossils - Leguminosae seeds, Palaeontological sites - Old Crow

Mead, E. M., and J. I. Mead

1989 Quaternary Zoogeography of the Nearctic *Dicrostonyx* Lemmings. Boreas 18:323-332.

Twenty-four fossil localities of *Dicrostonyx* lemmings are reported in North America. The fossil localities are all extralimital except two, one in Alaska and one in the Northwest Territories. The Pleistocene fossil distribution parallels the modern ranges: *Dicrostonyx hudsonius* east of Hudson Bay and the Appalachian Mountains and *D. torquatus* to the west. *Dicrostonyx* remains of the late Quaternary are generally found in disharmonious faunas and may therefore not be an accurate indicator of a strict tundra environment.

Location: AEU SCI QE 696 B73
Area: Eastern Beringia
Topics: Zoogeography - *Dicrostonyx*, Faunal remains - *Dicrostonyx torquatus*, Archaeological sites - Bluefish Caves, Palaeontological sites - Old Crow, Palaeontological sites - Cape Deceit, Palaeontological sites - Eastern Beringia, Beringian environment

Mead, J. I.

1987 Quaternary Records of Pika, *Ochotona*, in North America. Boreas 16:165-171.

Pika (Lagomorpha: *Ochotona*) have lived in North America since the Hemphillian land mammal age (late Pliocene). At least three species, *O. whartoni* (extinct giant pika), *O. princeps* (the living species), and unidentified large and small forms, lived in North America during the Quaternary. Forty-six localities of Quaternary-age pika are recorded. Many localities are actually site clusters, where packrat (Rodentia; *Neotoma*) middens or stratified sediments record pika fossils of many ages. Packrat middens in the arid west have provided pika dung pellets directly associated with plant macrofossils. Individual dung pellets provide direct radiocarbon dates and microhistological remains permit dietary reconstructions. Pika lived in northeastern portions of the continent during the Illinoian glacial age and possibly earlier. During the Wisconsinan glacial period, pika stayed in the mountainous west, but an exception exists. It is proposed that pika were not restricted to rocky/talus slopes during the Pleistocene, as is the living species in North America, and therefore should not be used as an indicator of ecological niche. Equable climates (cooler summers) may have been all that was needed for pika to migrate to new territories, areas without talus.

Location: AEU SCI QE 696 B73
Area: Eastern Beringia
Topics: Faunal associations, Faunal remains - *Ochotona*, Palaeontological sites - Eastern Beringia, Palaeontological sites - Cape Deceit, Palaeontological sites - Old Crow, Zoogeography - *Ochotona*

Morlan, R. E.

1983 Counts and Estimates of Taxonomic Abundance in the Faunal Remains: Microtine Rodents from Bluefish Cave 1. Canadian Journal of Archaeology 7(1):61-76.

Widely advertised theoretical and methodological deficiencies in counts of identified specimens (NISP) and the minimum number of individuals (MNI) have prompted a search for alternate methods of estimating taxonomic abundance in faunal remains. Most proposed alternatives have merely represented modifications or "refinements" of the MNI count outlined by Theodore White thirty years ago (White 1953). Modifications by Chaplin (1971) and Krantz (1968) are examined in this paper. Recently, an alternative, based on the Peterson index, has been proposed by Fieller and Turner (1982). Based on capture-recapture techniques used in the biological sciences, the Peterson index is superior to other proposed methods, because it is statistically well founded on the hypergeometric distribution and can be framed by data-based confidence intervals. Despite these advantages, the actual use of this estimate is limited by a number of practical exigencies that will undoubtedly force zooarchaeologists to continue to use NISP and MNI counts as abundance measurements of last resort. The assumptions and requirements for the use of the Peterson index, and the "behaviour" of this variable as compared with NISP and the methods of White, Chaplin, and Krantz, are illustrated with microtine rodent data from Bluefish Cave I, northern Yukon Territory.

Location: AEU PMC FC 65 C1152
Area: Yukon - northern, Eastern Beringia
Topics: Archaeological sites - Bluefish Caves, Faunal remains - statistical analysis, Faunal remains - *Clethrionomys*, Faunal remains - *Microtus*, Faunal remains - *Lemmus*, Faunal remains - *Dicrostonyx*, Faunal remains - *Sorex*, Faunal remains - *Lepus*, Faunal remains - *Spermophilus*, Faunal remains -

Marmota, Faunal remains - *Ondatra*, Faunal remains - *Mustela*, Faunal remains - *Canis*, Faunal remains - *Alopex*, Faunal remains - *Vulpes*, Faunal remains - *Equus*, Faunal remains - *Rangifer*, Faunal remains - *Bison*, Faunal remains - *Ovis*, Faunal remains - birds, Faunal remains - fish

1984 Biostratigraphy and Biogeography of Quaternary Microtine Rodents from Northern Yukon Territory, Eastern Beringia. In *Special Publication of Carnegie Museum of Natural History No. 8*, edited by H. H. Genoways and M. R. Dawson, pp. 184-199. Trustees of Carnegie Institute, Pittsburgh, Pennsylvania.

Recent work in northern Yukon Territory has produced samples of microtine rodent fossils from well documented stratigraphic contexts spanning much of late Pleistocene and Holocene time. *Clethrionomys*, *Microtus*, *Lemmus*, and forms of the Dicrostonychini are present throughout the sequence which is also punctuated by two appearances of *Phenacomys*. Evolutionary changes can be recognized within the *Dicrostonyx* lineage, the fossils of which are analyzed in terms of morphotypes defined by Agadjanian and von Koenigswald (1977). Vole fossils bearing similarities to *Microtus paroperarius* are labelled "*Microtus* sp. X" and are separated from both the former and the morphologically similar tundra vole, *M. oeconomus*, by means of measurements proposed by van der Meulen (1973, 1978).

The Yukon sequence is arranged in terms of intervals defined by Hopkins (1982), and possible correlations with Alaskan and Siberian sediments and faunas are discussed. The Beringian microtine record is seen to be woefully incomplete, poorly dated, and comprised of samples that are often very small. Nonetheless, some tentative proposals are put forth concerning biostratigraphy and biogeography, and gaps in the record are identified.

Location: AEU SCI QE 741 C76
Area: Yukon - northern, Eastern Beringia
Topics: Palaeontological sites - Old Crow, Archaeological sites - Bluefish Caves, Palaeontological sites - Western Beringia, Faunal remains - *Clethrionomys*, Faunal remains - *Microtus*, Faunal remains - *Dicrostonyx*, Faunal remains - *Lemmus*, Refugia, Stratigraphy, Zoogeography - microtine rodents

1989 Paleoecological Implications of Late Pleistocene and Holocene Microtine Rodents from the Bluefish Caves, Northern Yukon Territory. Canadian Journal of Earth Sciences 26:149-156.

Bluefish Caves 1, 2, and 3 have produced tens of thousands of vertebrate remains among which at least nine species of microtine rodents are represented: red-backed vole, *Clethrionomys rutilus*; collared lemming, *Dicrostonyx torquatus*; brown lemming, *Lemmus sibiricus*; singing vole, *Microtus miurus*; tundra vole, *Microtus oeconomus*; meadow vole, *Microtus pennsylvanicus*; yellow-cheeked or taiga vole, *Microtus xanthognathus*; muskrat, *Ondatra zibethicus*; and northern bog lemming, *Synaptomys borealis*. Late Pleistocene and Holocene components are clearly distinguishable from one another in each of the three caves, and each component can be subdivided within cave 1. This paper discusses (*i*) variations in taxonomic abundance through time and between site areas, (*ii*) contrasts in microhabitat between north-facing cave 1 and south-facing cave 2, and (*iii*) decreases in tooth size that may reflect a reduction in the length of the growing season. A general decrease in diversity is shown to involve increased dominance and decreased species richness and evenness. These changes are attributed to postglacial zonation of habitat.

Location: AEU SCI QE 1 C212
Area: Yukon - northern, Eastern Beringia
Topics: Archaeological sites - Bluefish Caves, Faunal remains - *Clethrionomys*, Faunal remains - *Microtus*, Faunal remains - *Lemmus*, Faunal remains - *Dicrostonyx*, Faunal remains - *Ondatra zibethicus*, Faunal remains - *Synaptomys borealis*, Faunal remains - *Equus*, Faunal remains - *Mammuthus*, Stratigraphy, Loess, Bone modification, Beringian vegetation, Taphonomy

Péwé, T. L., and D. M. Hopkins

1967 Mammal Remains of Pre-Wisconsin Age in Alaska. In *The Bering Land Bridge*, edited by D. M. Hopkins, pp. 266-270. Stanford University Press, Stanford, California.

Notes: Based on a Symposium held at the VII Congress of the International Association for Quaternary Research (INQUA), Boulder, Colorado, 1965.
Location: AEU SCI QE 39 H79
Area: Alaska
Topics: Faunal remains - Alaska, Faunal remains - *Castor*, Faunal remains - *Ondatra zibethicus*, Faunal remains - *Dicrostonyx torquatus*, Faunal remains - *Xenocyon*, Faunal remains - *Canis*, Faunal remains - *Vulpes*, Faunal remains - *Felis*, Faunal remains - *Mammut*, Faunal remains - *Mammuthus*, Faunal remains - *Cervus*, Faunal remains - *Cervalces*, Faunal remains - *Alces*, Faunal remains - *Rangifer*, Faunal remains - *Bison*, Faunal remains - *Bootherium*, Faunal remains - *Ovibos*, Faunal remains - *Ovis*, Faunal remains - *Equus*, Faunal remains - *Odobenus*, Pollen analysis

Pirozynski, K. A., A. Carter, and R. G. Day
1984 Fungal Remains in Pleistocene Ground Squirrel Dung from Yukon Territory, Canada. Quaternary Research 22:375-382.

Fungi in dung of the Arctic ground squirrel (*Spermophilus parryii*) collected near Dominion Creek, Yukon Territory, Canada, have a radiocarbon age of 12,200 ± 100 yr B.P. Most of the fungal remains are assignable to modern taxa, and most of these are either widespread saprobes or nonspecific coprophiles. However, specimens identified as *Chaetomium simile* and *Thecaphora deformans* represent fungi that may be more characteristic of rodent dung than that of other animals, inviting consideration of dung fungi as a potential source of paleontological data.

Location: AEU SCI QE 696 Q24
Area: Yukon - western, Eastern Beringia
Topics: Faunal remains - *Spermophilus parryii*, Plant macrofossils

Porter, L.
1986 Jack Wade Creek: An *in situ* Alaskan Late Pleistocene Vertebrate Assemblage. Arctic 39:297-299.

Sixty Late Pleistocene vertebrate fossils have been recovered from an inferred *in situ* sedimentary section of a placer mine near Jack Wade, east-central Alaska. The fossil assemblage, called the Jack Wade fauna, is composed of the partial remains of 18 animals, of which 11 are *Ovis* sp. cf. *O. dalli* Nelson (Dall sheep), 3 *Bison priscus* (Bojanus) (Steppe Bison), 2 *Rangifer tarandus* (Linnaeus) (Caribou), 1 *Equus (Asinus) lambei* Hay (Yukon Wild Ass) and 1 *Alces alces* (Linnaeus) (Moose). The assemblage is noteworthy in two respects: it is one of the few Late Pleistocene *in situ* assemblages known from Eastern Beringia and it is composed of large ungulates exclusively. Of these, a uniquely large proportion are mountain sheep.

Location: AEU SCI G 600 A67
Area: Alaska - eastern, Eastern Beringia
Topics: Palaeontological sites - Alaska, Faunal remains - *Ovis dalli*, Faunal remains - *Bison priscus*, Faunal remains - *Rangifer tarandus*, Faunal remains - *Equus lambei*, Faunal remains - *Alces alces*, Stratigraphy, Pollen analysis, Plant macrofossils

1988 Late Pleistocene Fauna of Lost Chicken Creek, Alaska. Arctic 41:303-313.

The fossil remains of one invertebrate and 16 vertebrate genera have been recovered from late Quaternary sediments of a large placer gold mine in east-central Alaska. Forty-six of 1055 fossils were recovered *in situ* from nine stratigraphic units at the Lost Chicken Creek Mine, Alaska. The fossils range in age from approximately 1400 yr BP (*Alces alces*) to greater than 50 400 yr BP (*Equus [Asinus] lambei*, *Rangifer tarandus*, Ovibovini cf. *Symbos cavifrons*, and *Bison priscus*). The assemblage includes an unusual occurrence of gallinaceous birds (*Lagopus* sp., ptarmigan), wolverine (*Gulo gulo*), the extinct American lion (*Panthera leo atrox*), collared lemmings (*Dicrostonyx torquatus*), and saiga antelope (*Saiga tatarica*).

Sediments at Lost Chicken Creek consist of 37 vertical m of sandy silt, pebbly sand, gravel and peat of fluvial, colluvial and eolian origins. Four episodes of fluvial deposition have alternated sequentially throughout the late

Wisconsinan with periods of eolian deposition and erosion. Solifluction has created a disturbed biostratigraphy at the site, yielding a fauna that must be considered a thanatocoenosis. The stratigraphy of Lost Chicken Creek is strikingly similar in major features to that of two coeval Beringian localities: Canyon Creek and Eva Creek, Alaska.

Location: AEU SCI G 600 A67
Area: Alaska - eastern, Eastern Beringia
Topics: Palaeontological sites - Alaska, Stratigraphy, Tephra - Sheep Creek, Glacial history - Alaska, Faunal remains - *Equus lambei*, Faunal remains - *Rangifer tarandus*, Faunal remains - *Symbos cavifrons*, Faunal remains - *Bison priscus*, Faunal remains - *Mammuthus primigenius*, Faunal remains - *Lagopus*, Faunal remains - *Saiga tatarica*, Faunal remains - *Panthera leo atrox*, Faunal remains - *Gulo gulo*, Faunal remains - birds, Plant macrofossils, Plant macrofossils - wood, Palaeontological sites - Lost Chicken Creek, Beringian environment, Palaeosols

Rand, A. L.
1954 The Ice Age and Mammal Speciation in North America. Arctic 7:31-35.

Location: AEU SCI G 600 A67
Area: Eastern Beringia
Topics: Refugia, Zoogeography, Faunal migration

Repenning, C. A., D. M. Hopkins, and M. Rubin
1964 Tundra Rodents in a Late Pleistocene Fauna from the Tofty Placer District, Central Alaska. Arctic 17:177-197.

Location: AEU SCI G 600 A67
Area: Alaska - central, Eastern Beringia
Topics: Palaeontological sites - Alaska, Stratigraphy, Loess, Molluscs, Insect macrofossils, Plant macrofossils, Faunal remains - *Spermophilus undulatus*, Faunal remains - *Dicrostonyx torquatus*, Faunal remains - *Lemmus sibiricus*, Faunal remains - *Microtus miurus*, Faunal remains - *Bison*, Faunal remains - *Equus*, Faunal remains - fish, Faunal remains - *Lepus*, Faunal remains - *Synaptomys*, Faunal remains - *Clethrionomys*, Zoogeography - rodents, Treeline fluctuations

Thorson, R. M., E. J. Dixon Jr., G. S. Smith, and A. R. Batten
1981 Interstadial Proboscidean from South-Central Alaska: Implications for Biogeography, Geology, and Archeology. Quaternary Research 16:404-417.

In 1980 a large proboscidean femur, probably *Mammuthus* sp., was found *in situ* in a bluff exposure at the mouth of the Tyone River in the northwestern part of the Copper River Basin, Alaska. The regional setting, stratigraphy, radiocarbon chronology, flora, and implications of the fossil locality, which represents the first documented occurrence of Pleistocene terrestrial mammalian fauna in southern Alaska, are described. Radiocarbon dates and stratigraphic relations at the site indicate that the sediments containing the fossil accumulated during the transition from interstadial to glacial conditions during terminal middle Wisconsin time. During this interval the immediate vicinity was unforested and large areas of south-central Alaska may have been available for faunal and possibly human habitation. This documented find, dated at 29,450 $\pm$ 610 ^{14}C yr B.P., extends the known range for Pleistocene mammals and possibly steppe-tundra conditions southward at least 150 km, and suggests that mountain passes through the Alaska Range to the north were ice free during the last part of the middle Wisconsin interstadial.

Location: AEU SCI QE 696 Q24
Area: Alaska - southern, Eastern Beringia
Topics: Faunal remains - *Mammuthus*, Beringian environment, Glacial history - Alaska, Glacial geomorphology, Stratigraphy, Plant macrofossils - peat, Plant macrofossils - *Salix* twigs, Insect macrofossils - beetle elytra, Plant macrofossils - bryophytes, Plant macrofossils - *Dryas* leaves, Plant macrofossils -

Equisetum stems, Plant macrofossils - *Polytrichum juniperinum*, Plant macrofossils - *Rhytidium rugosum*, Plant macrofossils - graminoid rhizome, Faunal migration

Weber, F. R., T. D. Hamilton, D. M. Hopkins, C. A. Repenning, and H. Haas
1981 Canyon Creek: A Late Pleistocene Vertebrate Locality in Interior Alaska. Quaternary Research 16:167-180.

The Canyon Creek vertebrate-fossil locality is an extensive road cut near Fairbanks that exposes sediments that range in age from early Wisconsin to late Holocene. Tanana River gravel at the base of the section evidently formed during the Delta Glaciation of the north-central Alaska Range. Younger layers and lenses of fluvial sand are interbedded with arkosic gravel from Canyon Creek that contains tephra as well as fossil bones of an interstadial fauna about 40,000 years old. Solifluction deposits containing ventifacts, wedge casts, and rodent burrows formed during a subsequent period of periglacial activity that took place during the maximum phase of Donnelly Glaciation about 25,000-17,000 years ago. Overlying sheets of eolian sand are separated by a 9500-year-old paleosol that may correlate with a phase of early Holocene spruce expansion through central Alaska. The Pleistocene fauna from Canyon Creek consists of rodents (indicated by burrows), *Mammuthus primigenius* (woolly mammoth), *Equus lambei* (Yukon wild ass), *Camelops hesternus* (western camel), *Bison* sp. cf. *B. crassicornis* (large-horned bison), *Ovis* sp. cf. *O. dalli* (mountain sheep), *Canis* sp. cf. *C. lupus* (wolf), *Lepus* sp. cf. *L. othus* or *L. arcticus* (tundra hare), and *Rangifer* sp. (caribou). This assemblage suggests an open landscape in which trees and tall shrubs were either absent or confined to sheltered and moist sites. *Camelops* evidently was present in eastern Beringia during the middle Wisconsin interstadial interval but may have disappeared during the following glacial episode. The stratigraphic section at Canyon Creek appears to demonstrate that the Delta Glaciation of the north-central Alaska Range is at least in part of early Wisconsin age and was separated from the succeeding Donnelly Glaciation by an interstadial rather than interglacial episode.

Location: AEU SCI QE 696 Q24
Area: Alaska - central, Eastern Beringia
Topics: Stratigraphy, Palaeontological sites - Canyon Creek, Palaeontological sites - Alaska, Palaeosols, Plant macrofossils, Faunal remains - *Equus lambei*, Faunal remains - *Mammuthus primigenius*, Faunal remains - *Camelops hesternus*, Faunal remains - *Rangifer*, Faunal remains - *Bison crassicornis*, Faunal remains - *Ovis dalli*, Faunal remains - *Canis lupus*, Faunal remains - *Alces*, Faunal remains - *Lepus*, Molluscs, Dating - apatite, Aeolian deposits, Glacial history - Alaska, Periglacial features - fossil ice wedges

Whitmore Jr., F. C., and H. L. Foster
1967 *Panthera atrox* (Mammalia: Felidae) from Central Alaska. Journal of Paleontology 41:247-251.

A lower jaw of the large Pleistocene cat *Panthera atrox* (Leidy) was found on an alluvial flat about 180 miles northeast of Fairbanks, Alaska. It was probably washed out of carbonaceous silt deposits which, in the adjacent area, have also yielded bones of *Equus*, *Bison*, *Rangifer*, *Cervus*, and Elaphantidae. The *Panthera* jaw falls within the size range of the series from Rancho La Brea, California, and differs from Rancho La Brea specimens only in a few characteristics. *P. atrox* appears to have been significantly larger than extinct or modern Asian tigers. Despite continuity of the American and Asian land masses at times during the late Pleistocene, present evidence indicates discontinuity between the populations of great cats on the two continents.

Location: AEU SCI QE 701 J86
Area: Alaska - central, Eastern Beringia
Topics: Faunal remains - *Panthera atrox*, Stratigraphy, Faunal remains - *Equus*, Faunal remains - *Equus niobrarensis*, Faunal remains - *Bison*, Faunal remains - *Rangifer*, Faunal remains - *Rangifer arcticus*, Faunal remains - *Cervus*, Zoogeography - *Panthera*, Faunal associations, Palaeontological sites - Lost Chicken Creek

Youngman, P. M.

1986 The Extinct Short-Faced Skunk *Brachyprotoma obtusata* (Mammalia, Carnivora): First Records for Canada and Beringia. Canadian Journal of Earth Sciences 23:419-424.

A mandible of the extinct short-faced skunk (*Brachyprotoma obtusata*) and a tooth, provisionally assigned to this species, are reported for the first time from the Pleistocene of northern Yukon Territory, Canada,

Location: AEU SCI QE 1 C212
Area: Yukon - northern, Eastern Beringia
Topics: Faunal remains - *Brachyprotoma obtusata*, Archaeological sites - Bluefish Caves, Palaeontological sites - Old Crow, Zoogeography - *Brachyprotoma obtusata*, Faunal extinction

PART 5. ARCHAEOLOGY AND HUMAN HISTORY

Anderson, D. D.

1984 Prehistory of North Alaska. In *Handbook of North American Indians, Volume 5, Arctic*, edited by D. Damas, pp. 80-93. Smithsonian Institution, Washington, D.C.

Notes: W. C. Sturtevant (series ed.).
Location: AEU HSS RF E 77 H23
Area: Alaska - northern, Eastern Beringia
Topics: Faunal remains - *Equus*, Faunal remains - *Bison*, Lithics, Archaeological sites - Alaska, Archaeological sites - Gallagher Flint Station, Archaeological sites - Trail Creek, Archaeological sites - Onion Portage, Cultural traditions, Palaeontological sites - Old Crow

Bobrowsky, P. T., N. R. Catto, J. W. Brink, B. E. Spurling, T. H. Gibson, and N. W. Rutter

1990 Archaeological Geology of Sites in Western and Northwestern Canada. In *Archaeological Geology of North America*, edited by N. P. Lasca and J. Donahue, pp. 87-122. Centennial Special Volume 4. Geological Society of America, Boulder, Colorado.

Area: Yukon, Northwest Territories, British Columbia, Eastern Beringia
Topics: Geoarchaeology, Archaeological sites - Yukon, Archaeological sites - Bluefish Caves, Archaeological sites - British Columbia, Glacial history, Ice-free corridor, Refugia, Lithics, Bone modification, Sea level changes, Plant macrofossils, Molluscs, Vegetation history, Faunal remains, Glacial lake sequences - Glacial Lake Peace, Glacial lake sequences, Tephra - Eastern Beringia, Palaeontological sites - Old Crow

Bonnichsen, R.

1978 Critical Arguments for Pleistocene Artifacts from the Old Crow Basin, Yukon: A Preliminary Statement. In *Early Man in America from a Circum-Pacific Perspective*, edited by A. L. Bryan, pp. 102-118. Occasional Papers No 1 of the Department of Anthropology, University of Alberta. Archaeological Researches International, Edmonton, Alberta.

An important question in the search for early man is: What constitutes valid evidence that can be used to demonstrate the antiquity of man? Most scholars have been looking for deeply buried sites, clearly of Pleistocene age, which contain stone tools and extinct faunal remains. Recently, a considerable body of new information has been assembled from the Beringia Refugium located at Asia's gateway to North America which does not meet either of the above criteria. Approximately 100 bone artifacts and hundreds of altered bones which are thought to be of Pleistocene age have been located in redeposited sediments along the Old Crow and Porcupine Rivers in the Northern Yukon. The purpose of this paper is two-fold. The criteria used in identifying bone artifacts will be outlined, as will the arguments which support the contention that the artifacts were made during the Pleistocene epoch.

Notes: Introduction used as abstract.
Location: AEU HSS GN 17 E12
Area: Yukon - northern, Eastern Beringia
Topics: Palaeontological sites - Old Crow, Bone modification, Refugia, Faunal remains - Yukon, Taphonomy, Faunal remains - *Bison crassicornis*, Faunal remains - *Mammuthus*, Faunal remains - *Alces latifrons*, Faunal remains - *Equus*, Faunal remains - *Rangifer*

1979 *Pleistocene Bone Technology in the Beringian Refugium*. Archaeological Survey of Canada Paper No. 89, National Museum of Man Mercury Series. National Museums of Canada, Ottawa, Ontario. 297 pp.

In the unglaciated section of northwestern North America, known as the Beringian Refugium, Pleistocene vertebrate remains are well preserved in the perma-frost deposits. Major paleontological collections have been gathered from primarily four areas: Old Crow Flats in the northern Yukon; the Dawson vicinity in south central Yukon; Lost Chicken Creek, west central Alaska; and from the Fairbanks region in central Alaska. Radiocarbon dates on these assemblages, which lack stratigraphic context, range in age between 10,000 and greater than 40,000 years before present.

Between 1973 and 1978 large vertebrate remains held in existing museum paleontological collections were examined in search of elements altered by man. The megafauna, whose remains were examined, lived in a now extinct environment known as the Arctic-Steppe Biome. This biome was a huge Pleistocene grassland unequalled today in either size or character, and extended in a circumpolar belt from Beringia to the British Isles. A community of large herd herbivores including mammoth, mastodon, horse, bison, muskox and caribou co-existed in the eastern sector of the Refugium.

A taphonomic approach which emphasizes an understanding of post-mortem processes that affect the death assemblage in passing from the biosphere to the lithosphere has guided the analysis. A variety of alternative processes may lead to the alteration of bone structure and the distribution of bone elements. Observations made on how modern day geological, biological, and cultural systems affect death assemblages have been used to link process with pattern (altered bones).

A control reference collection of bones modified by known processes was assembled and bone breaking experiments were conducted for the purpose of separating fossil bones altered by geological, biological and cultural agencies.

Bone breaking experiments have been conducted which demonstrate that the same principles employed in working stone can also be used for breaking bones for marrow and for flaking bone and ivory into artifacts. These experiments provide important analogs for explaining fractured fossil vertebrate limb elements.

Bone, antler, and ivory from the Arctic-Steppe tundra herd herbivores have been modified by a variety of techniques. Several hundred bones exhibit spiral fractures (fractures that spiral around long bone diaphyses). Fractures of this kind are usually associated with marrow extraction. More than 90 artifacts have been located. These implements indicate that early New World populations made bone and/or ivory bifaces, small blade cores, bone edge spalls very similar to micro-burins and tools unifacially trimmed along their edges. In addition to tools made by flaking, a series of refined production techniques were employed for whittling, grinding, planing, and polishing specimens. Diagnostic artifacts produced using these techniques include a flesher, wedges, a bone awl, and sharp edged specimens that may be cutting implements.

Evidence is lacking that would indicate the procurement patterns used by early groups in exploiting the large herd herbivores. Many of the bone artifacts were probably employed for butchering and hide working. These simple tools made from the limb bones and tusks may have been discarded at butchering stations. Mobility would have been enhanced by this discard pattern as new artifacts could be rapidly produced at each new butchering site.

On the basis of the surviving tools, it is reasonable to assume that the early Beringian populations had a flexible repertoire of tool making techniques at their disposal. Generalized repertoires would have permitted new tool forms to be created as preferences, needs and changing materials dictated.

Location: AEU POLAR 903:(*41) ASC-89
Area: Eastern Beringia, Yukon - northern, Alaska
Topics: Refugia, Palaeontological sites - Eastern Beringia, Palaeontological sites - Old Crow, Palaeontological sites - Lost Chicken Creek, Faunal remains - Eastern Beringia, Faunal remains - *Bison alaskensis*, Faunal remains - *Rangifer*, Faunal remains - *Rangifer tarandus*, Faunal remains - *Symbos*, Faunal remains - *Symbos cavifrons*, Faunal remains - *Mammuthus primigenius*, Faunal remains - *Equus*, Faunal remains - *Panthera leo atrox*, Faunal remains - *Canis lupus*, Faunal remains - *Cervalces*, Faunal remains - *Bison*, Faunal remains - *Bison crassicornis*, Faunal remains - *Equus asinus*, Taphonomy, Bone modification, Beringian ecology, Megafauna, Human migration

Bonnichsen, R., D. Stanford, and J. L. Fastook

1987 Environmental Change and Developmental History of Human Adaptive Patterns; The Paleoindian Case. In *North America and Adjacent Oceans During the Last Deglaciation*, edited by W. F. Ruddiman and H. E. Wright Jr., pp. 403-424. The Geology of North America, Volume K-3. Geological Society of America, Boulder, Colorado.

Could environmental change be the cause underlying the origin, internal restructuring, and extinction of human adaptive patterns? Recent syntheses in the Quaternary sciences present an opportunity to investigate the linkages and changes in the internal dynamics among the earth's climatic, glaciologic, geologic, oceanographic, biotic, and human adaptive systems. Prehistorians have long been aware of the importance of environment as a potential catalyst for change

in human adaptive systems and have traditionally emphasized local and regional relationships. With the increasing number of available syntheses documenting human adaptive responses to late Pleistocene and early Holocene environments, it is now possible to enlarge the survey and attempt a continental overview of how the end of the last major climate cycle (18 to 6 ka) was linked to terrestrial environments and human adaptive systems in North America. Because of the breadth of the topic, emphasis is placed on the period of greatest change between 12 and 10 ka.

Notes: Abstract taken from introduction. Review of North American archaeological sites.
Location: AEU SCI QE 697 N864
Area: Eastern Beringia, Alaska, Yukon - northern
Topics: Archaeological sites - Eastern Beringia, Archaeological sites - Bluefish Caves, Archaeological sites - Anangula, Archaeological sites - Gallagher Flint Station, Archaeological sites - Onion Portage, Lithics, Archaeological sites - Dry Creek, Archaeological sites - Healy Lake, Archaeological sites - Groundhog Bay, Archaeological sites - Tangle Lakes, Archaeological sites - Trail Creek, Archaeological sites - Charlie Lake Cave, Archaeological sites - Walker Road, Archaeological sites - Manis, Faunal remains, Faunal remains - *Alopex*, Faunal remains - *Equus*, Faunal remains - *Rangifer*, Faunal remains - *Bison*, Faunal remains - *Mammuthus*, Faunal remains - *Spermophilus columbianus*, Faunal remains - *Lepus americanus*, Faunal remains - *Microtus*, Faunal extinction, Climate history, Cultural traditions, Geoarchaeology, Dating, Lithic affinities, Palaeontological sites - Old Crow, Bone modification

Bonnichsen, R., and D. Young
1980 Early Technological Repertoires: Bone to Stone. Canadian Journal of Anthropology 1(1):123-128.

Location: AEU PMC GN 1 C22
Area: Eastern Beringia
Topics: Human migration, Bone modification, Refugia, Palaeontological sites - Old Crow, Lithics, Beringian environment, Faunal extinction, Archaeological sites - Diuktai Cave, Cultural traditions - Diuktai

Borden, C. E.
1970 New Evidence of Early Cultural Relations between Eurasia and Western North America. In *Proceedings VIIIth International Congress of Anthropological and Ethnological Sciences, Tokyo and Kyoto, 1968. Volume III. Ethnology and Archaeology*. Symposium S-11 Prehistoric Cultural Relationships in Northern Eurasia and Northern North America, pp. 331-337. Science Council of Japan, Tokyo, Japan.

Location: AEU SCI GN 3 I59
Area: Eastern Beringia, Canada - western
Topics: Cultural traditions, Beringian land bridge connection, Archaeological sites - Eastern Beringia, Human migration, Lithics, Bone modification

Bryan, A. L.
1968 Some Problems and Hypotheses Relative to the Early Entry of Man into America. Anthropologica 10:157-177.

Les études portant sur ce qu'on appelle le "corridor libre de glace" situé à l'est des Rocheuses, sont trop souvent imprégnées d'impressions vagues. L'auteur de cet article évalue l'état actuel de nos connaissances sur le pléistocène du détroit de Béring et du "corridor". Cette étude l'amène à aborder la question de l'homme primitif en Amérique et à présenter deux hypothèses de travail: (1) que le "corridor" fut couvert de glace une seule fois entre les années 20,000 et 9,000 et (2) que l'immigration la plus importante en Amérique s'est accomplie au cours d'une période s'étendant de 25,000 à 20,000 années avant le siècle présent. De plus, l'auteur soitient que l'industrie primitive des têtes de flèches fut développée au sud de la couche de glace et qu'elle s'est propagée par la suite vers le nord.

Location: AEU PMC GN 1 A62
Area: Eastern Beringia
Topics: Human migration, Ice-free corridor, Faunal remains - *Equus niobrarensis*, Faunal remains - *Mammuthus columbi*, Faunal remains - *Antilocapra*, Faunal remains - *Bison*, Faunal migration, Glacial history, Plant macrofossils, Sea level changes, Lithics, Cultural traditions, Archaeological sites - Anangula, Archaeological sites - Zhoukoudian
Language: English, with abstract in French.

1969 Early Man in America and the Late Pleistocene Chronology of Western Canada and Alaska. Current Anthropology 10:339-365.

The thesis has been presented that all the available geological evidence supports the working hypothesis that man must have entered Alaska prior to 35,000 years ago in order to explain his presence south of the coalescent ice sheets 11,500 years ago. This postulate leads to the further working hypothesis that all "classic" American "Paleo-Indian" traditions as well as those generally labeled as "Archaic" were essentially home grown, and evolved from the basic technological traditions of bifaces, blades, burins, certain bone-working traditions, and little-known traditions of working wood, fibers, and skins which came into America before 35,000 years ago. Arguments have been presented elsewhere that the known linguistic and physical diversity of American Indians also fits the hypothesis of diversification within America over many millennia as the people adapted themselves to the many available environments.

Notes: Abstract taken from concluding text.
Location: AEU PMC GN 1 C97
Area: Eastern Beringia, Alaska, Yukon - northern
Topics: Human migration, Glacial history, Lithics, Lithic affinities, Archaeological sites - Onion Portage, Archaeological sites - Anangula, Archaeological sites - Eastern Beringia, Palaeontological sites - Old Crow, Faunal remains, Plant macrofossils, Ice-free corridor, Climate history, Cultural traditions, Bone modification

1991 The Current Status of Research on Pleistocene Americans. In *INQUA, 13th International Congress, Beijing, China, Abstracts*, p. 36.

Area: Eastern Beringia
Topics: Human migration, Cultural traditions, Lithics

Carlson, R. L.

1983 The Far West. In *Early Man in the New World*, edited by R. Shutler Jr., pp. 73-96. Sage Publications, Beverly Hills, California.

Location: AEU HSS E 61 E12
Area: British Columbia - western, British Columbia - Queen Charlotte Islands, Alaska, Eastern Beringia, Kamchatka
Topics: Glacial history, Archaeological sites, Lithics, Cultural traditions, Lithic affinities, Palaeontological sites - Old Crow, Archaeological sites - Anangula, Archaeological sites - Bluefish Caves, Archaeological sites - Groundhog Bay, Archaeological sites - Healy Lake, Archaeological sites - Trail Creek, Archaeological sites - Manis, Archaeological sites - Lake Ushki, Archaeological sites - Japan - Hokkaido

Cinq-Mars, J.

1978 Late Pleistocene and Early Holocene Prehistory: Cultural Assemblages and Sites in Northeastern Beringia. In *AMQUA, 5th Biennial Meeting, Edmonton, Alberta, Abstracts*, pp. 160-161.

Location: AEU HSS QE 696 A5212

Area: Eastern Beringia, Yukon - northern
Topics: Palaeontological sites - Old Crow, Archaeological sites - Bluefish Caves, Bone modification, Lithics, Faunal remains - Yukon, Faunal remains - *Equus*

1979 Bluefish Cave I: A Late Pleistocene Eastern Beringian Cave Deposit in the Northern Yukon. Canadian Journal of Archaeology No. 3:1-32.

This paper describes some of the preliminary results of a test excavation carried out at the Bluefish Caves site (northern Yukon Territory) during the summer of 1978. The data at hand allow us to suggest that the site was utilized by human groups at the end of the Pleistocene, between 13,000 and 10,000 B.P. The deposit is viewed as important mainly because of the primary (or nearly so) context of its constituants [sic] (lithic specimens, Pleistocene faunal elements, etc.) which is a rather unique situation for sites of that age in the boreal Cordillera.

Location: AEU PMC FC 65 C1152
Area: Yukon - northern, Eastern Beringia
Topics: Archaeological sites - Bluefish Caves, Geoarchaeology, Sedimentology, Plant macrofossils, Molluscs, Palynological sites - Hanging Lake, Pollen analysis - Yukon, Vegetation history - Yukon, Refugia, Insect macrofossils, Lithics, Faunal remains - *Alces alces*, Faunal remains - *Ovis dalli*, Faunal remains - *Bison*, Faunal remains - *Mustela*, Faunal remains - *Equus lambei*, Faunal remains - *Rangifer tarandus*, Faunal remains - *Cervus elaphus*, Faunal remains - *Lepus americanus*, Faunal remains - *Lepus arcticus*, Faunal remains - *Spermophilus parryii*, Faunal remains - *Peromyscus*, Faunal remains - *Lemmus sibiricus*, Faunal remains - *Dicrostonyx torquatus*, Faunal remains - *Microtus*, Faunal remains - *Clethrionomys rutilus*, Faunal remains - *Alopex lagopus*, Faunal remains - *Vulpes vulpes*, Faunal remains - fish, Faunal remains - birds

Clark, D. W.

1983 Is There a Northern Cordilleran Tradition? Canadian Journal of Archaeology 7(1):23-48.

An early northwestern subarctic tradition is proposed to account for occupation preceding the Paleo-Arctic tradition (appearance of microblades). This northern Cordilleran tradition, based in part on MacNeish's Cordilleran tradition, also co-existed with the Paleo-Arctic in areas east of the latter and to some extent elsewhere in a geographical mosaic. This article first focuses on early components, in the estimated and postulated 12,000 to 10,000 year age range, which are characterized by bifaced projectile points including fluted points. The northern Cordilleran later takes into account assemblages which are poorly explained in terms of the Paleo-Arctic and Northern Archaic traditions and for which a Plains origin, implied by attribution to the Plano tradition, may be erroneous. The encompassing thesis of this article is that northern interior prehistory is more complex than is suggested by its present organization into major tradition constructs. Proposals made here thus are not asserted to be ultimate historical reality but are offered in a tradition of discussion and reassessment of data.

Location: AEU PMC FC 65 C1152
Area: Alaska, Yukon, Eastern Beringia
Topics: Cultural traditions, Lithics, Lithic affinities, Archaeological sites - Trail Creek, Archaeological sites - Onion Portage, Archaeological sites - Dry Creek, Archaeological sites - Healy Lake, Archaeological sites - Bluefish Caves, Archaeological sites - Alaska, Ice-free corridor

1984 Northern Fluted Points: Paleo-Eskimo, Paleo-Arctic, or Paleo-Indian. Canadian Journal of Anthropology 4(1):65-81.

Proposals accounting for the origin of northern fluted points, from Alaska and the Yukon Territory, are examined. Considered are hypotheses that these points developed within or are a part of the Denbigh Flint complex of the Northern Archaic tradition and hence bear no relationship to Clovis or other Paleo-Indian fluted points, that they belong with the Paleo-Arctic tradition, or that they are a Paleo-Indian artifact. It is reasoned that, although answers remain inconclusive on the basis of presently-available evidence, most northern fluted points are early. Their source may lie either within the

north or in the fluted point horizon of the south. Their partial association with early microblades can be explained by contact between peoples of two different cultural traditions.

Location: AEU PMC GN 1 C22
Area: Alaska, Yukon, Eastern Beringia
Topics: Archaeological sites - Alaska, Archaeological sites - Yukon, Archaeological sites - Onion Portage, Archaeological sites - Tangle Lakes, Archaeological sites - Healy Lake, Archaeological sites - Dry Creek, Archaeological sites - Gallagher Flint Station, Cultural traditions, Lithics

1984 Some Practical Applications of Obsidian Hydration Dating in the Subarctic. Arctic 37:91-109.

Eight case studies of obsidian hydration dating in the Koyukuk River region of northwestern interior Alaska are discussed. Historiographic conclusions include recognition of late and early microblade industries, apparent verification of the hypothesis that northern fluted points date within a Paleo-Indian time frame, and validation of a Tuktu-like first millennium A.D. Northern Archaic phase. However, variance in the data and lack of firm hydration rates render the results less precise than is desired.

Methodological conclusions have ramifications that should apply throughout the subarctic region and well beyond. These are: 1) Hydration measurements may be unreliable for dating individual specimens; 2) Lack of closely controlled hydration rates or dependence on 14-C dates with large errors for calibration can be crippling; 3) The average of a series of specimens can be used to date components which were formed during a brief period of occupation, though high variance of the data may be disconcerting; 4) Variance was low in one case for specimens all derived from the same piece of raw material, but for dating it may be necessary to find, through induced hydration or other means, the precise hydration rate applicable to each different piece of raw material (from a single component); and 5) Many variables may be responsible for results which render some sample sets unreliable or unusable, especially those from surface sites. Some of these variables require further technical investigation - loss of the hydration layer and recommencement of hydration after exposure to forest and tundra fires, for instance. Other factors are reasonably well understood by researchers, but it would be desirable to have computer simulations of site contexts in order to assess the magnitude, correlations, and cumulative results of their effects.

Location: AEU SCI G 600 A67
Area: Alaska, Yukon, Eastern Beringia
Topics: Dating - obsidian hydration, Lithics, Cultural traditions, Archaeological sites - Healy Lake, Archaeological sites - Dry Creek, Archaeological sites - Alaska, Archaeological sites - Yukon

Clark, D. W., and A. McFadyen Clark

1983 Paleo-Indians and Fluted Points: Subarctic Alternatives. Plains Anthropologist 28-102 (Pt. 1):283-292.

For more than three decades a postulated northern (Alaskan) origin for Paleo-Indians bearing fluted projectile points has been based on sparse fluted point occurrences in the north and expectations engendered by the hypothesis of migration from northeastern Siberia. To reaffirm the northern hypothesis this article models northern data that have become available during the past 15 years. Major elements of this model are (a) that tentative dating indicates that some northern fluted points are only a few hundred years younger than the oldest of their southern equivalent (Clovis points), (b) that with future discoveries this preliminary dating of fluted points in the north will be extended to encompass a broader time range, and (c) when that occurs the earliest northern fluted points will be found to be older than southern fluted points, which (d) would indicate spread from north to south.

We profess that there is sufficient uncertainty regarding southern origin as being the ultimate and immutable source of fluted points that alternatives merit continued consideration. Thus, it is feasible at this time to set forth specific conditions to be met in order to validate the subarctic alternative. A corollary of the northern development hypothesis is that Paleo-Indians were present in the northwestern corner of North America preceding the arrival there of an Asian-derived microblade industry about 11,000 years ago.

Location: AEU PMC E 51 P69
Area: Alaska, Eastern Beringia
Topics: Lithics, Dating - obsidian hydration, Human migration, Cultural traditions, Archaeological sites - Healy Lake, Archaeological sites - Dry Creek, Archaeological sites - Bluefish Caves, Archaeological sites - Gallagher Flint Station, Archaeological sites - Alaska, Archaeological sites - Yukon

Crossen, K. J., T. R. Dilley, D. R. Yesner, and C. E. Holmes

1992 Late Quaternary Environmental Change and Human Occupation of the Broken Mammoth Site, Delta Junction, East-Central Alaska. In *AMQUA, 12th Biennial Meeting, Davis, California, Program and Abstracts*, p. 37.

Area: Alaska - central, Eastern Beringia
Topics: Archaeological sites - Broken Mammoth, Archaeological sites - Alaska, Lithics, Geoarchaeology, Loess, Palaeosols, Plant macrofossils, Faunal remains - Alaska, Faunal remains - fish, Faunal remains - birds, Insect macrofossils, Molluscs, Palaeowinds

Dixon Jr., E. J.

1975 The Gallagher Flint Station, an Early Man Site on the North Slope, Arctic Alaska, and its Role in Relation to the Bering Land Bridge. Arctic Anthropology 12(1):68-75.

The Gallagher Flint Station, an Alaskan archaeological site located near the upper Sagavanirktok River in the Arctic foothills province, has been radiocarbon-dated at 10,540 ± 150 B.P. The site is situated on a large ice-contact kame formed during the Antler Valley stage of the Itkillik glaciation, a late Wisconsinan event. The material remains suggest that the site's inhabitants may have been the bearers of the technological tradition from which both Eskimo and Aleut material cultures have been derived. The hypothesis is advanced that Pleistocene land mammal hunters inhabiting Beringia adapted to sea mammal exploitation simultaneously with the flooding of the Land Bridge and extinction of Pleistocene megafauna.

Location: AEU PMC GN 1 A68
Area: Alaska, Eastern Beringia
Topics: Archaeological sites - Alaska, Archaeological sites - Gallagher Flint Station, Archaeological sites - Trail Creek, Archaeological sites - Anangula, Archaeological sites - Onion Portage, Archaeological sites - Healy Lake, Lithics, Lithic affinities, Geoarchaeology, Ice-free corridor, Pollen records - Alaska, Human migration, Faunal remains - Alaska

1986 The Gallagher Flint Station, an Early Man Site on the North Slope, Arctic Alaska, and its Role in Relation to the Bering Land Bridge. In *Beringia in the Cenozoic Era*, edited by V. A. Kontrimavichus, pp. 608-619. Russian Translation Series No. 28. A. A. Balkema, Rotterdam, The Netherlands.

The Gallagher Flint Station is located near the upper Sagavanirktok River in the arctic foothills of Brooks Range. It was discovered on a large ice contact kame formed during the Antler Valley stage of the Itkillik glaciation, a late Wisconsin (Sartan) event.

Three distinct localities have been recognized within the site, namely I, IA and II. These three localities have been distinguished on the basis of the vertical stratigraphy, topographic relationships, typological comparison and radiocarbon chronology.

Locality I contains cores, blades, platform flakes, unifacially retouched artifacts, and waste flakes. The archeological material recovered from cultural level I yielded a radiocarbon date of 10,540±150 BP.

Locality IA is characterized by bifacial projectile points, a drill and waste flakes. Radiocarbon analyses show that the locality was occupied 2620±175 years BP.

Locality II resembles locality IA. Cultural remains recovered from the upper level are represented by flakes, blades and bifacially chipped artifacts. Two radiocarbon dates indicate that the period of occupation of locality II was between 2,970 and 2,765 BP.

In comparing locality I, Gallagher Flint Station, with such known Alaskan arctic stations as Onion Portage (Akmak assemblage), Trail Creek Caves, Anangula, or the Chindadn assemblage from the lowest levels at Healy Lake, the author concludes that locality I belongs to the Early Aurignacoid culture lacking bifacial stone tools; this culture adapted well to changed conditions in the tundra that stretched from Alaska to Siberia.

The wide difference between the coastal tradition of unifacial blades, represented by Anangula and locality I, and the bifacial tradition of inner Alaska is apparently due to different migrations to the New World.

The migrants that left Gallagher Flint Station (locality I) apparently represented the ancestors of both Aleut and Eskimo cultures.

Notes: Translation of *Beringiya v Kainozoe*, Vladivostok, 1976. Collection of papers presented at the All-Union Symposium "The Bering Land Bridge and its Role in the History of Holarctic Floras and Faunas in the Late Cenozoic" held at Khabarovsk in May, 1973.
Location: AEU POLAR 56:(*3) KON
Area: Eastern Beringia, Alaska - northern
Topics: Archaeological sites - Gallagher Flint Station, Lithics, Archaeological sites - Alaska, Pollen records - Alaska, Human migration

Dixon, E. J., and R. M. Thorson
1984 Taphonomic Analysis and Interpretation in North American Pleistocene Archaeology. Quaternary Research 22:155-159.

Notes: Introduction to papers presented at the symposium "Taphonomic Analysis and Interpretation in North American Pleistocene Archaeology" held in Fairbanks, Alaska, April 1982.
Location: AEU SCI QE 696 Q24
Area: Eastern Beringia
Topics: Human migration, Taphonomy, Archaeological studies - Eastern Beringia, Bone modification

Dumond, D. E.
1980 The Archaeology of Alaska and the Peopling of America. Science 209:984-991.

The proposed existence of a biotically productive tundra-steppe on the exposed Bering Land Bridge of the late Pleistocene aids conceptualization of the migrations of early Asian hunters. But clear knowledge of the human occupants of northwesternmost America before 11,000 years ago is elusive. Evidence indicates that at that time the Alaskan peoples had a culture generally based on microliths that, while obviously derived from Asia, were not sufficiently similar to the tools of the earliest widely distributed hunters of more southerly North America to support any direct and close relation between the two cultures.

Notes: Summary used as abstract.
Location: AEU SCI Q 1 S41
Area: Alaska, Eastern Beringia, Kamchatka
Topics: Human migration, Ice-free corridor, Lithics, Lithic affinities, Archaeological sites - Alaska, Archaeological sites - Bluefish Caves, Archaeological sites - Trail Creek, Archaeological sites - Anangula, Archaeological sites - Onion Portage, Archaeological sites - Dry Creek, Archaeological sites - Tangle Lakes, Archaeological sites - Healy Lake, Archaeological sites - Gallagher Flint Station, Archaeological sites - Lake Ushki, Archaeological sites - Japan - Hokkaido, Beringian ecology, Megafauna, Palaeontological sites - Old Crow, Faunal remains, Bone modification, Cultural traditions, Cultural traditions - Diuktai

1984 Prehistory: Summary. In *Handbook of North American Indians, Volume 5, Arctic*, edited by D. Damas, pp. 72-79. Smithsonian Institution, Washington, D.C.

Notes: W. C. Sturtevant (series ed.).
Location: AEU HSS RF E 77 H23

Area: Alaska, Eastern Beringia
Topics: Palaeontological sites - Old Crow, Bone modification, Lithics, Archaeological sites - Alaska, Archaeological sites - Anangula, Archaeological sites - Healy Lake, Archaeological sites - Gallagher Flint Station, Cultural traditions, Human migration

Fladmark, K. R.
1979 Routes: Alternate Migration Corridors for Early Man in North America. American Antiquity 44:55-69.

This paper reviews the relative feasibility of interior and coastal routes for early man entering southern North America from Beringia during the late Pleistocene. Paleoenvironmental and archaeological data suggest that a chain of sea-level refugia around the North Pacific coast could have provided a real alternative to the interior "ice-free" corridor and that maritime cultural adaptations may have been among the first to arrive south of Canada.

Location: AEU PMC CC 1 A6
Area: Eastern Beringia, British Columbia - western, British Columbia - Queen Charlotte Islands
Topics: Human migration, Ice-free corridor, Glacial lake sequences, Archaeological sites - Eastern Beringia, Archaeological sites - Groundhog Bay, Archaeological sites - Dry Creek, Archaeological sites - Anangula, Archaeological sites - Diuktai Cave, Glacial history, Sea level changes, Lithics, Refugia, Vegetation history, Lithic affinities, Cultural traditions - Diuktai, Faunal migration, Zoogeography - *Rangifer dawsoni*

Fladmark, K. R., J. C. Driver, and D. Alexander
1988 The Paleoindian Component at Charlie Lake Cave (HbRf 39), British Columbia. American Antiquity 53:371-384.

Charlie Lake Cave (HbRf 39) is a stratified site in northeastern British Columbia, Canada, containing a fluted-point component at the base of the excavated deposits. The small artifact assemblage includes a fluted point, stone bead, core tool, and retouched flake. A diverse associated fauna includes fish, birds, and mammals, indicating a more open environment than exists today. Radiocarbon dates suggest that the artifact assemblage was deposited about 10,500 years ago.

Location: AEU PMC CC 1 A6
Area: British Columbia - northeastern, Eastern Beringia
Topics: Archaeological sites - Charlie Lake Cave, Archaeological sites - Rocky Mountains, Palaeontological sites - Rocky Mountains, Lithics, Geoarchaeology, Sedimentology, Glacial lake sequences - Glacial Lake Peace, Ice-free corridor, Bone modification, Vegetation history, Faunal remains - fish, Faunal remains - birds, Faunal remains - *Lepus*, Faunal remains - *Lepus americanus*, Faunal remains - *Spermophilus*, Faunal remains - *Ondatra zibethicus*, Faunal remains - *Microtus*, Faunal remains - *Peromyscus*, Faunal remains - *Bison*

Gruhn, R.
1988 Linguistic Evidence in Support of the Coastal Route of Earliest Entry into the New World. Man 23:77-100.

A study of aboriginal language distributions supports Knut Fladmark's hypothesis that the initial route of entry of peoples into the New World was along the Pacific coast rather than through the interior ice-free corridor. The greatest diversification of aboriginal languages, as indicated by number of language isolates and major subdivisions of language phyla, is observed on the Pacific Northwest Coast, in California, on the northern Gulf of Mexico Coast, in Middle America, and in South America. Following a conventional principle of historical linguistics, it is assumed that the development of language diversification is proportional to time depth of human occupation of an area. A review of the archaeological evidence from the areas of greatest language diversification indicates a time depth of at least 35,000 years for human occupation of most of the Americas.

Location: AEU PMC GN 1 M25
Area: Eastern Beringia
Topics: Human migration, Refugia, Linguistics, Archaeological sites, Ice-free corridor, Archaeological sites - Bluefish Caves, Archaeological sites - Charlie Lake Cave, Palaeontological sites - Old Crow, Bone modification, Lithics, Cultural traditions

Guthrie, R. D.

1984 The Evidence for Middle-Wisconsin Peopling of Beringia: An Evaluation. Quaternary Research 22:231-241.

Broken large mammal fossil bones in eastern Beringia have been used to argue for a middle-Wisconsin, or earlier, time of human entry into North America. It has been inferred that these controversial Pleistocene bones are artifacts because (1) they are similar to those found in archaeological sites and (2) they can be reproduced in the laboratory by replication. However, fractured, flaked, polished, faceted, cut, and scratched bones similar to the purportedly human artifacts from Beringia are known to be produced by natural processes. New experimental data demonstrate that identifications of Pleistocene bone artifacts on the basis of differential staining and fresh breakage are suspect. Physical processes, such as the violent forces of river ice breakups in the north, and bone crushing by mammalian scavengers produce similar pseudo-artifacts. Additionally, the middle-Wisconsin dates associated with some of the finished tools, and human and dog bones from Beringia are open to question. The lack of credible dates on these artifacts raises doubt about the model of human colonization of Beringia, developed in the 1960s, which proposed an interstadial colonization of the New World.

Notes: Paper presented at the symposium "Taphonomic Analysis and Interpretation in North American Pleistocene Archaeology" held in Fairbanks, Alaska, April 1982.
Location: AEU SCI QE 696 Q24
Area: Eastern Beringia, Yukon - northern
Topics: Palaeontological sites - Old Crow, Bone modification, Taphonomy, Human migration, Faunal remains, Zoogeography - *Crocuta*

Hamilton, T. D.

1978 Geologic Perspectives on Early Man in Alaska. In *AMQUA, 5th Biennial Meeting, Edmonton, Alberta, Abstracts*, pp. 123-125.

Location: AEU HSS QE 696 A5212
Area: Alaska, Eastern Beringia
Topics: Archaeological sites - Alaska, Archaeological sites - Healy Lake, Archaeological sites - Gallagher Flint Station, Archaeological sites - Trail Creek, Archaeological sites - Anangula, Archaeological sites - Groundhog Bay, Archaeological sites - Onion Portage, Archaeological sites - Dry Creek, Archaeological sites - Tangle Lakes, Lithics, Faunal remains

Harington, C. R.

1972 Evidence of Early Man in the Old Crow Basin, Yukon Territory. The Arctic Circular 22(3):118–128.

Location: AEU SCI G 600 A674
Area: Yukon - northern, Eastern Beringia
Topics: Palaeontological sites - Old Crow, Faunal remains - Yukon, Bone Modification, Lithics, Plant macrofossils

1973-1975 A Bone Tool Found with Ice Age Mammal Remains near Dawson City, Yukon Territory. The Arctic Circular 23(1):2-5.

Location: AEU SCI G 600 A674
Area: Yukon, Eastern Beringia
Topics: Faunal remains - *Rangifer*, Stratigraphy, Faunal remains - *Bison crassicornis*, Faunal remains - *Mammuthus primigenius*, Faunal remains - *Equus*, Faunal remains - *Symbos cavifrons*, Faunal remains - *Panthera leo atrox*, Faunal remains - *Canis lupus*, Palaeontological sites - Yukon, Bone modification, Faunal remains - *Rangifer tarandus*

Haynes Jr., C. V.
1971 Time, Environment, and Early Man. Arctic Anthropology **8(2):3-14.**

In the last two years five more radiocarbon dated sites have been added to the list of those within the Middle Paleo-Indian period. Some aspects of each can be questioned but all may have valid if not compelling evidence. New sites within the late Paleo-Indian period are found almost yearly.

Models for the rate of obsidian hydration within the Paleo-Indian periods are controversial, but on typological grounds the Borax Lake fluted points fall within the late Paleo-Indian period and support the linear rate model.

Stratigraphic evidence suggests that the apparent short time interval for several geochronological events between 12,000 and 11,000 B. P. are real and not the result of a particular rate of increase in atmospheric radiocarbon.

Recent palynological data suggest there were no significant vegetational reversals during deglaciation 14,000 to 9000 B.P. suggesting a unidirectional warming trend. In the Southwest there is no major pollen shift to correspond with that of 10,500 to 10,000 B.P. in the eastern United States. Instead the major change occurs soon after 12,000 B.P. and corresponds to (1) a marked change in the alluvial record, (2) the appearance of Clovis game hunters, and (3) a marked decline in Rancholabrean fauna.

The possible interrelationships of the expansion of Clovis hunters 11,500 to 11,000 B.P. to deglaciation, climatic change, and extinction of Pleistocene fauna need to be pursued by the use of several working hypotheses.

Location: AEU PMC GN 1 A68
Area: Eastern Beringia
Topics: Cultural traditions, Ice-free corridor, Archaeological sites, Archaeological sites - Onion Portage, Archaeological sites - Anangula, Archaeological sites - Healy Lake, Archaeological sites - Groundhog Bay, Faunal associations, Human migration, Dating - obsidian hydration, Dating - radiocarbon, Lithics, Palaeontological sites - Old Crow, Vegetation history

Haynes, C. V.
1980 The Clovis Culture. Canadian Journal of Anthropology **1(1):115-121.**

Clovis tool kits vary from site to site and there are suggestions of regional variations, but samples are still woefully inadequate. Clovis people appear to have been foragers but mainly hunted mammoths and bison for both food and material resources. From their lithic technology an Old World origin seems likely. In Beringia before 11,000 B.P. there appear to have been two distinct lithic traditions, and Clovis developed from the one without microblades.

The rapid spread of the Clovis culture took place during a period of the greatest environmental change since the end of the Sangamon interglacial. More data are needed on the geochronology of archaeological changes north and south of the ice-free corridor through Canada.

Location: AEU PMC GN 1 C22
Area: Eastern Beringia
Topics: Lithics, Archaeological sites, Archaeological sites - Siberia, Archaeological sites - Malta/Buryet, Archaeological sites - Afontova Gora, Archaeological sites - Alaska, Archaeological sites - Dry Creek, Cultural traditions, Cultural traditions - Diuktai, Ice-free corridor, Human migration, Dating - radiocarbon

1982 Were Clovis Progenitors in Beringia? In *Paleoecology of Beringia*, edited by D. M. Hopkins, J. V. Matthews Jr., C. E. Schweger and S. B. Young, pp. 383-398. Academic Press, New York, New York.

The Clovis culture represents the earliest clearly defined culture known in North America and is restricted to a period of only 500 years between 11,500 and 11,000 years ago. Clovis tool kits vary from site to site, and there are regional variations although samples are still woefully inadequate to determine regional differences in lifestyles. Clovis people appear to have been foragers but primarily were hunters of mammoth and bison for both food and material resources.

An Old World origin for Clovis seems probable on the basis of comparisons of their bone and stone technology with that of Europe and Siberia during the late Paleolithic. In eastern Siberia before 11,000 BP, there appear to have been two distinct lithic traditions, one dominated by microblades (Dyuktai) and one without microblades (Mal'ta-Afontova). Clovis may have been a descendant of the latter people, who crossed Beringia in pursuit of big game between 20,000 and 15,000 years ago when steppe-tundra united the two northern continents. Subsequent decline of steppe-tundra and Pleistocene megafauna after 15,000 BP may have led the hunting cultures farther south-eastward until they passed from the habitats of *M. primigenius* to those of *M. columbi* and *M. jeffersoni* about 13,000 to 12,000 years ago. The nearly explosive increase and spread of the Clovis culture thereafter may have been the direct result of this contact with game resources not previously exploited by man, or at least not with the intensity brought to bear by the Clovis big game specialists. The Clovis dispersal took place during a period of the greatest environmental change subsequent to the end of the Sangamon interglacial. The combination was more than many elements of the Pleistocene megafauna could withstand.

Location: AEU SCI QE 720 W47, AEA PMA/ASA 560.45 P174
Area: Eastern Beringia, Western Beringia
Topics: Lithics, Cultural traditions, Cultural traditions - Diuktai, Cultural traditions - Malta/Afontova, Archaeological sites - Afontova Gora, Archaeological sites - Malta/Buryet, Archaeological sites - Diuktai Cave, Archaeological sites - Dry Creek, Palaeontological sites - Old Crow, Megafauna, Faunal extinction, Human migration, Bone modification, Faunal remains, Faunal remains - *Mammuthus primigenius*

Holmes, C. E., and D. R. Yesner

1992 Investigating the Earliest Alaskans: The Broken Mammoth Archaeological Project. Arctic Research of the United States 6(Fall):6-9.

The Broken Mammoth and Mead sites in central Alaska may provide the first conclusive evidence that humans and mammoths coexisted in Alaska, the gateway to the New World. More significantly, these archaeological excavations provide data about subsistence and the environment during one of the earliest phases of human settlement in North America.

Location: AEU SCI G 593 A675
Area: Alaska - central, Eastern Beringia
Topics: Archaeological sites - Broken Mammoth, Archaeological sites - Alaska, Loess, Faunal remains - Alaska, Geoarchaeology, Palaeosols, Vegetation history - Alaska, Lithics

Irving, W. N.

1968 Upper Pleistocene Archaeology in Old Crow Flats, Yukon Territory. The Arctic Circular 17(2):18–19.

Location: AEU SCI G 600 A674
Area: Yukon - northern, Eastern Beringia
Topics: Faunal remains - *Mammuthus primigenius*, Faunal remains - *Megalonyx*, Faunal remains - *Bootherium*, Faunal remains - *Camelops*, Faunal remains - *Mammut americanum*, Faunal remains - *Cervalces*, Faunal remains - *Castoroides*, Faunal remains - *Ovibos moschatus*, Faunal remains - *Equus*, Faunal remains - *Bison*, Plant macrofossils - wood, Palaeontological sites - Old Crow, Geoarchaeology, Bone modification

1971 Recent Early Man Research in the North. Arctic Anthropology 8(2):68-82.

Recent field evidence from the far northwest supports the hypothesis that man arrived in North America well before the maximum Wisconsin glaciation. The actual date of arrival is unknown, but apparently it was before 30,000 B.P.

In other aspects of Early Man research, systematic survey for archaeological sites and the development of new analytical techniques have prepared the way for the definition of new culture-historical units.

Location: AEU PMC GN 1 A68
Area: Eastern Beringia
Topics: Human migration, Archaeological sites - Eastern Beringia, Archaeological sites - Trail Creek, Archaeological sites - Healy Lake, Archaeological sites - Malta/Buryet, Archaeological sites - Onion Portage, Cultural traditions, Faunal remains, Faunal migration, Palaeontological sites - Old Crow, Bone modification, Lithics, Lithic affinities, Dating

1978 Pleistocene Archaeology in Eastern Beringia. In *Early Man in America from a Circum-Pacific Perspective*, edited by A. L. Bryan, pp. 96-101. Occasional Papers No 1 of the Department of Anthropology, University of Alberta. Archaeological Researches International, Edmonton, Alberta.

Location: AEU HSS GN 17 E12
Area: Eastern Beringia, Yukon - northern
Topics: Palaeontological sites - Old Crow, Bone modification, Lithic affinities, Geoarchaeology, Glacial history, Faunal remains - *Bison*, Faunal remains, Plant macrofossils, Molluscs, Human migration

1982 Pleistocene Cultures in Old Crow Basin: Interim Report. In *Peopling of the New World*, edited by J. E. Ericson, R. E. Taylor and R. Berger, pp. 69-79. Ballena Press Anthropological Papers No. 23. Ballena Press, Los Altos, California.

Notes: L. J. Bean and T. C. Blackburn (series eds.).
Location: AEU HSS E 61 P42
Area: Yukon - northern, Eastern Beringia
Topics: Palaeontological sites - Old Crow, Bone modification, Lithics, Geoarchaeology, Glacial history, Glacial lake sequences, Periglacial features, Plant macrofossils - wood, Faunal migration, Faunal remains, Faunal remains - *Rangifer tarandus*, Faunal remains - *Mammuthus*, Faunal remains - *Dicrostonyx henseli*, Faunal remains - *Castoroides ohioensis*, Faunal remains - *Alopex lagopus*

1985 Context and Chronology of Early Man in the Americas. Annual Review of Anthropology 14:529-555.

Location: AEU HSS GN 1 A618
Area: Eastern Beringia
Topics: Human migration, Archaeological studies, Cultural traditions, Archaeological sites, Faunal extinction, Lithics, Palaeontological sites - Old Crow, Bone modification, Faunal associations, Dentition

Irving, W. N., and J. Cinq-Mars

1974 A Tentative Archaeological Sequence for Old Crow Flats, Yukon Territory. Arctic Anthropology 11 Supplement:65-81.

Recent archaeological surveys in the middle Porcupine Basin and especially the Old Crow Flats area have provided us with a cultural sequence which appears to span most of the post-glacial period and segments of Wisconsin times. Assemblages are for the most part comparable to those found in neighboring interior Alaska. Complexes such as Kayuk and Denbigh Flint, and later early Eskimo manifestations, appear to be missing or poorly represented. Finally, the site distribution appears to reflect an important shift in the land utilization pattern, from an early intensive use of lookout site areas to a more riverine-adapted hunting pattern.

Location: AEU PMC GN 1 A68
Area: Yukon - northern, Eastern Beringia
Topics: Archaeological sites - Yukon, Archaeological sites - Anangula, Archaeological sites - Dry Creek, Archaeological sites - Healy Lake, Palaeontological sites - Old Crow, Bone modification, Lithics, Lithic affinities, Glacial lake sequences

Irving, W. N., and C. R. Harington
1973 Upper Pleistocene Radiocarbon-Dated Artefacts from the Northern Yukon. Science 179:335-340.

A bone implement and a number of bone artefacts broken or otherwise modified by man were discovered in 1966 by C. R. Harington and P. Lord at Old Crow River locality 14N, a site that had produced a rich assemblage of Pleistocene fossils. During the summers of 1966 through 1968 Harington and Lord collected approximately 390 fossil vertebrate specimens from locality 14N. Irving visited the site with Harington in 1966 shortly after the artefacts were found, and in 1967 and 1970 recovered additional fossils in the vicinity.

Our initial findings were reported in 1967 and 1968 before all of the components of the present fossil collection had been identified, and prior to radiocarbon dating of the artefacts. We now wish to describe and discuss the bone implement and two of the artefacts in the light of (i) their identification as artefacts, (ii) their stratigraphic situation, (iii) their radiocarbon dates, and (iv) the paleoenvironment as suggested by associated mammal remains. Our studies of fossils from more than 70 sites in the Old Crow Basin, several of which appear to have yielded bone artefacts as well, are continuing.

Notes: Abstract taken from introduction.
Location: AEU SCI Q 1 S41
Area: Yukon - northern, Eastern Beringia
Topics: Palaeontological sites - Old Crow, Geoarchaeology, Plant macrofossils, Faunal remains - *Mammuthus primigenius*, Faunal remains - *Rangifer tarandus*, Faunal remains - *Bison crassicornis*, Faunal remains - *Ochotona*, Faunal remains - *Lepus*, Faunal remains - *Castor canadensis*, Faunal remains - *Castoroides ohioensis*, Faunal remains - *Ondatra zibethicus*, Faunal remains - *Microtus miurus*, Faunal remains - *Cuon*, Faunal remains - *Alopex lagopus*, Faunal remains - *Gulo*, Faunal remains - *Panthera atrox*, Faunal remains - *Homotherium*, Faunal remains - *Mammut americanum*, Faunal remains - *Equus*, Faunal remains - *Camelops hesternus*, Faunal remains - *Alces alces*, Faunal remains - birds, Faunal remains - fish, Molluscs - *Anodonta beringiana*, Vegetation history - Yukon, Climate history - Yukon, Bone modification, Taphonomy

Irving, W. N., J. T. Mayhall, F. J. Melbye, and B. F. Beebe
1977 A Human Mandible in Probable Association with a Pleistocene Faunal Assemblage in Eastern Beringia: A Preliminary Report. Canadian Journal of Archaeology No. 1:81-93.

In 1976 a portion of mandible of a human child was found in probable association with bones of Pleistocene fauna in point bar deposits on the Old Crow River, northern Yukon Territory. The morphology and odontology of the mandible are described, and it is concluded that no specific or sub-specific taxonomic designation can be assigned. It is suggested that the mandible is of an age greater than 20,000 years, and may relate to a Pleistocene human occupation of eastern Beringia.

Location: AEU PMC FC 65 C1152
Area: Yukon - northern, Eastern Beringia
Topics: Palaeontological sites - Old Crow, Human migration, Human/hominid remains, Faunal remains - *Castoroides ohioensis*, Faunal remains - *Microtus*, Faunal remains - *Synaptomys*, Faunal remains - *Panthera leo atrox*, Faunal remains - *Mammuthus primigenius*, Faunal remains - *Mammuthus columbi*, Faunal remains - *Equus lambei*, Faunal remains - *Symbos cavifrons*, Faunal remains - *Equus*, Faunal remains - *Mammuthus*, Faunal remains - *Camelops hesternus*, Faunal remains - *Cervus elaphus*, Faunal remains - *Rangifer tarandus*, Faunal remains - *Bison*

Jopling, A. V., W. N. Irving, and B. F. Beebe

1981 Stratigraphic, Sedimentological and Faunal Evidence for the Occurrence of Pre-Sangamonian Artifacts in Northern Yukon. In *Comision XII, El Poblamiento de América, Coloquio, Evidencia arquelógica de ocupación humana en América anterior a 11,500 años a.p.*, edited by A. Bryan, p. 27. Union International de Ciencias Prehistoricas Y Protohistoricas, X Congreso, Mexico, Octubre 19-24, 1981.

Location: AEU HSS GN 701 P97
Area: Eastern Beringia, Yukon - northern
Topics: Stratigraphy, Glacial lake sequences - Old Crow, Bone modification, Faunal remains - Yukon, Palaeontological sites - Yukon

Larsen, H.

1970 The Eskimo Culture and Its Relationship to Northern Eurasia. In *Proceedings VIIIth International Congress of Anthropological and Ethnological Sciences, Tokyo and Kyoto, 1968. Volume III. Ethnology and Archaeology.* Symposium S-11 Prehistoric Cultural Relationships in Northern Eurasia and Northern North America, pp. 338-340. Science Council of Japan, Tokyo, Japan.

Location: AEU SCI GN 3 I59
Area: Eastern Beringia
Topics: Archaeological sites - Eastern Beringia, Archaeological sites - Trail Creek, Archaeological sites - Onion Portage, Faunal remains - *Equus*, Lithics, Lithic affinities, Bone modification

Laughlin, W. S.

1963 Eskimos and Aleuts: Their Origins and Evolution. Science **142:633-645.**

Location: AEU SCI Q 1 S41
Area: Eastern Beringia, Alaska
Topics: Human migration, Linguistics, Archaeological sites - Alaska, Lithics, Lithic affinities, Archaeological sites - Anangula, Cultural traditions, Human genetics, Human/hominid remains, Dentition, Archaeological sites - Zhoukoudian

Martin, P. S.

1973 The Discovery of America. Science **179:969-974.**

America was the largest landmass undiscovered by hominids before the time of *Homo sapiens*. The Paleolithic pioneers that crossed the Bering Bridge out of Asia took a giant step. They found a productive and unexploited ecosystem of over 10^7 square miles (2.6×10^7 square kilometers). As Bordes has said, "There can be no repetition of this until man lands on a [habitable] planet belonging to another star."

At some time toward the end of the last ice age, big game hunters in Siberia approached the Arctic Circle, moved eastward across the Bering platform into Alaska, and threaded a narrow passage between the stagnant Cordilleran and Laurentian ice sheets. I propose that they spread southward explosively, briefly attaining a density sufficiently large to overkill much of their prey.

Notes: Abstract taken from introduction.
Location: AEU SCI Q 1 S41
Area: Eastern Beringia
Topics: Faunal extinction, Human migration, Megafauna

McKennan, R. A., and J. P. Cook

1970 Prehistory of Healy Lake, Alaska. In *Proceedings VIIIth International Congress of Anthropological and Ethnological Sciences, Tokyo and Kyoto, 1968. Volume III. Ethnology and Archaeology.* Sectional Meeting C, pp. 182-184. Science Council of Japan, Tokyo, Japan.

Location: AEU SCI GN 3 I59
Area: Alaska - central
Topics: Archaeological sites - Healy Lake, Lithics

Morlan, R. E.

1977 Fluted Point Makers and the Extinction of the Arctic-Steppe Biome in Eastern Beringia. Canadian Journal of Archaeology No. 1:95-108.

Data and inferences concerning the Late Pleistocene extinction of the Arctic-Steppe biome in eastern Beringia are summarized, and their implications for early man in the New World are examined. A possible link is noted between these extinction phenomena and the sudden widespread appearance of fluted points in interior North America. Various aspects of this problem, including the ecology of the Mackenzie Corridor, the various possible causes of extinction, and the question of archaeological visibility, are discussed with respect to the current need for more and better information on many aspects of Paleoindian research.

Location: AEU PMC FC 65 C1152
Area: Eastern Beringia
Topics: Beringian ecology, Palaeontological sites - Old Crow, Lithics, Human migration, Sea level changes, Ice-free corridor, Megafauna, Refugia, Vegetation history, Faunal extinction, Cultural traditions, Cultural traditions - Diuktai

1978 Early Man in Northern Yukon Territory: Perspectives as of 1977. In *Early Man in America from a Circum-Pacific Perspective*, edited by A. L. Bryan, pp. 78-95. Occasional Papers No 1 of the Department of Anthropology, University of Alberta. Archaeological Researches International, Edmonton, Alberta.

Location: AEU HSS GN 17 E12
Area: Eastern Beringia, Yukon - northern
Topics: Refugia, Human migration, Glacial history - Yukon, Beringian environment, Palaeontological sites - Old Crow, Geoarchaeology, Faunal remains - Yukon, Faunal remains - *Bison*, Faunal remains - *Equus*, Faunal remains - *Rangifer*, Plant macrofossils, Insect macrofossils, Molluscs, Bone modification, Glacial lake sequences - Old Crow

1980 Taphonomy as an Aid to Archaeological Reconnaissance and Interpretation: An Example from Northern Yukon Territory. In *AMQUA, 6th Biennial Meeting, Orono, Maine, Abstracts and Program*, pp. 143-144.

Location: AEU HSS QE 696 A5212
Area: Yukon - northern, Eastern Beringia
Topics: Taphonomy, Palaeontological sites - Old Crow, Bone modification

1980 *Taphonomy and Archaeology in the Upper Pleistocene of Northern Yukon Territory: A Glimpse of the Peopling of the New World.* Archaeological Survey of Canada Paper No. 94, National Museum of Man Mercury Series. National Museums of Canada, Ottawa, Ontario. 380 pp.

Beringia, long heralded as the route of entry for mankind into the New World, has only slowly yielded evidence of ancient human activity. Recently, several areas of Beringia have produced fossilized vertebrate remains which are wonderful for their paleontological significance and both perplexing and promising for their archaeological potential. Some of these pieces have been known for more than 40 years but were difficult to evaluate due to poorly understood stratigraphic contexts and poorly developed analogues for the interpretation of bone, antler, and ivory alterations. During the past 14 years, Old Crow Flats and several other areas of the Yukon Territory have gradually provided tens of thousands of Upper Pleistocene vertebrate fossils among which there are enough artificially modified specimens to increase the archaeological record by a hundred fold. These discoveries have prompted a series of field and laboratory studies specifically designed to improve our analogues for interpreting bone, antler, tusk, and tooth specimens which have been altered by both natural and artificial agencies.

Another recent development is the importation of the concept of taphonomy, originally defined 40 years ago, to the field of archaeology. This integrative concept encourages the view that human activity is but one of many factors which can influence the condition of bone and the composition of bone assemblages between the time of death of an animal and the moment of the recovery of its fossilized remains from the sedimentary contexts in which they have been preserved. This view makes explicit the need to develop carefully documented interpretive analogues with which to improve the assignment of meaning to the alterations of bones and the assemblages in which they occur. One purpose of this report is to review the current status of several aspects of our knowledge of bone alterations and to make recommendations as to how our analogues can be enlarged and improved.

Yet another theme in early man studies during the past decade has been the explicit pronouncement of "standards for evidence" with which to judge purported ancient indicators of human occupation. These so-called standards have been defined in response to the plethora of poorly substantiated claims, the poor quality and quantity of published reports of both fact and fiction in the early man field, and a pervasive feeling of frustration which has arisen from scores of failed promises and from the difficulties encountered by anyone who attempts to decipher the awesome record of confused stratigraphy, unexpected (or undocumented) "dates," and sometimes dubious artifact identifications. There is no doubt that standards of some kind are needed, that we must at least know what our units of analysis should be, but we have gone too far in our definition of "standards." We have forgotten (perhaps forsaken) the fact that archaeologists usually study the results of human behaviour which happen to be preserved in geological deposits. There are only two fundamental assumptions required in this study: (1) that human behaviour can be understood by studying the material results of that behaviour; and (2) that the results of human behaviour are always (or at least usually) separable from the results of various other natural processes. But a third criterion has been forced into the issue, viz., that these presumably interpretable results of human behaviour must occur in an "archaeological site" where the predominant (if not the only) attributes are attributable to human activity. Hence we are in danger of overlooking (or even omitting by definition) a substantial amount of archaeological information simply because it does not meet standards which have been defined in a very arbitrary way.

In this report I have tried to bring these themes together by examining several collections of Pleistocene vertebrate fossils from the northern Yukon Territory among which an archaeological record can be defined on the basis of a growing series of field observations and experimental studies. Some of these collections can be related to a stratigraphic framework which suggests that human occupation began in the Yukon Territory more than 50,000 years ago - an age unprecedented in previous data-based reports. The larger significance of this record is not yet clear. For example, the evolutionary status of these early eastern Beringians is unknown, and we know very little about the cultural adaptive capabilities and particular sequence of paleoenvironmental changes which permitted or encouraged the appearance of human societies in North America at this time.

None of the indicators of this remarkable archaeological record has been found in an undisturbed "archaeological site," and each specimen has been interpreted in terms of a large series of analogues which are useful regardless of the geological contexts in which the individual specimens and assemblages occur. Many of these analogues deserve a considerable amount of additional study in both the field and the laboratory, and I have indicated in this report where the major weaknesses may lie and how the archaeological interpretation might be successfully challenged. I have also shown that the search for undisturbed archaeological deposits has been systematically narrowed. Current plans for field and laboratory work include comprehensive surveys of the most promising stratigraphic units in the northern Yukon and further studies of many forms of bone, antler, tooth, and tusk alteration which could be misinterpreted and incorrectly attributed to natural or artificial causes.

Location: AEA PMA/ASA 917.103 N213
Area: Yukon - northern, Alaska, Eastern Beringia
Topics: Palaeontological sites - Old Crow, Bone modification, Faunal remains - Yukon, Taphonomy, Beringian ecology, Faunal migration, Human migration, Refugia, Sea level changes, Geoarchaeology, Glacial

history - Yukon, Tephra - Yukon, Glacial lake sequences - Old Crow, Molluscs - *Anodonta beringiana*, Plant macrofossils, Dating, Archaeological sites - Healy Lake, Archaeological sites - Gallagher Flint Station, Archaeological sites - Dry Creek, Archaeological sites - Bluefish Caves, Archaeological sites - Yukon, Archaeological sites - Alaska

1982 Pleistocene Archaeology in Old Crow Basin, Northern Yukon, Canada: A Critical Reappraisal. In *AMQUA, 7th Biennial Meeting, Seattle, Washington, Program and Abstracts*, p. 144.

Location: AEU HSS QE 696 A5212
Area: Yukon - northern, Eastern Beringia
Topics: Palaeontological sites - Old Crow, Bone modification, Taphonomy

1983 Pre-Clovis Occupation North of the Ice Sheets. In *Early Man in the New World*, edited by R. Shutler Jr., pp. 47-63. Sage Publications, Beverly Hills, California.

In this chapter I have adopted the hypothesis that the alterations on fossil bones from the early Wisconsinan floodplain deposits (Disconformity A and deeper), which date to about 80,000 years ago, were the result of human activity. However, there are alternative explanations that do not depend on the presence of man at that early time period. Thus, it cannot be proved or disproved that man was present 80,000 years ago on the basis of present evidence. These alternative hypotheses, which involve the actions of natural forces, do not, however, invalidate the evidence of man's presence based on the C-14 dates of 25-30,000 years obtained on directly dated, definitely man-made artifacts recovered from younger contexts in which they had been redeposited, and these dates are still of a respectable antiquity relative to those from the rest of the New World.

Notes: Conclusions used as abstract.
Location: AEU HSS E 61 E12
Area: Eastern Beringia, Yukon - northern, Alaska
Topics: Refugia, Beringian environment, Palaeontological sites - Old Crow, Archaeological sites - Alaska, Archaeological sites - Bluefish Caves, Archaeological sites - Dry Creek, Human migration, Glacial history, Geoarchaeology, Dating, Tephra - Old Crow, Glacial lake sequences, Glacial lake sequences - Old Crow, Periglacial features - fossil ice wedges, Taphonomy, Bone modification, Climate history, Plant macrofossils, Pollen records, Vegetation history, Palynological sites - Hungry Creek, Lithics, Faunal remains, Faunal remains - *Mammuthus primigenius*, Faunal remains - *Marmota monax*, Faunal remains - *Spilogale*, Faunal remains - *Bison crassicornis*

1984 Toward the Definition of Criteria for the Recognition of Artificial Bone Alterations. Quaternary Research 22:160-171.

Cutting, fracturing, flaking, and polishing of bones and other osseous materials may in some instances be interpreted as evidence of former human activity. Such interpretations must avoid confusion with the wide variety of natural processes that alter bones. Reliable criteria are prerequisite to sound inferences based on bone, regardless of whether they have been redeposited or recovered from primary assemblages. Criteria must be defined by means of actualistic studies (neotaphonomy) and experiments that demonstrate causal relationships between patterns of alteration and the processes that produce them. The criteria can be employed in the interpretation of fossil bones (paleotaphonomy) on the basis of uniformitarian principles. At the present time, such relationships are relatively well understood in the case of cut marks on bones, and modest progress has been made in investigating fractured and flaked bones. Polished bones are little understood and difficult to interpret.

Notes: Paper presented at the symposium "Taphonomic Analysis and Interpretation in North American Pleistocene Archaeology" held in Fairbanks, Alaska, April 1982.
Location: AEU SCI QE 696 Q24
Area: Eastern Beringia, Yukon - northern
Topics: Taphonomy, Bone modification, Palaeontological sites - Old Crow

1986 Pleistocene Archaeology in Old Crow Basin: A Critical Reappraisal. In *New Evidence for the Pleistocene Peopling of the Americas*, edited by A. L. Bryan, pp. 27-48. Peopling of the Americas Symposia Series. Center for the Study of Early Man, University of Maine, Orono, Maine.

Some of the bones and antlers found among the rich paleontological deposits of Old Crow Basin in northern Yukon Territory have been interpreted as artifacts made prior to permineralization of the fossils. Previous reports have attempted to show that artificial alterations are exhibited by fossils recovered from an Early Wisconsinan floodplain dated to approximately 80,000 years B.P. In this paper, all such specimens, from Disconformity A and deeper deposits, are reexamined with alternate interpretations presented. The alternate interpretations do not prove that humans were not present in Early Wisconsinan time, but they show that such ancient presence of people cannot be demonstrated on the basis of evidence gathered thus far.

The fact that alternate interpretations can be devised for all specimens from Disconformity A does not obviate the identification of redeposited artifacts found on the modern banks and bars of the Old Crow River. It does mean, however, that none of the definite artifacts has a known stratigraphic context in the Old Crow Pleistocene, although several artifacts have now been directly dated by radiocarbon techniques. The directly dated specimens show that people were present in eastern Beringia by at least 25,000-30,000 years ago.

Location: AEU HSS E 61 N48
Area: Yukon - northern, Eastern Beringia
Topics: Palaeontological sites - Old Crow, Bone modification, Taphonomy, Dating, Geoarchaeology, Tephra - Yukon, Glacial lake sequences - Old Crow, Faunal remains - Yukon, Faunal associations, Plant macrofossils, Molluscs - *Anodonta beringiana*

Morlan, R. E., and J. Cinq-Mars

1982 Ancient Beringians: Human Occupation in the Late Pleistocene of Alaska and the Yukon Territory. In *Paleoecology of Beringia*, edited by D. M. Hopkins, J. V. Matthews Jr., C. E. Schweger and S. B. Young, pp. 353-381. Academic Press, New York, New York.

Evidence for human occupation in eastern Beringia now extends back in time to the early Wisconsin (about 60,000 years ago), but for the earliest periods this record must be interpreted on the basis of altered bone, antler, and ivory specimens that have been recovered from redeposited contexts. Such interpretations depend on a broad analytical approach in which taphonomic concepts are employed to identify a more representative suite of bone-altering agencies. Pending the discovery and excavation of undisturbed archaeological sites of such ancient provenance, we have declined to define a technological complex on the basis of these materials. Their existence nonetheless raises a number of interesting questions concerning the time and means of human adaptation to northern latitudes. Not the least of these is the evolutionary status of the first Beringians whose identity may be shrouded in the little-known record of human evolution in East Asia.

A recently excavated deposit at the Bluefish Caves affords a new late Wisconsin record of human occupation during the most severe period of glaciation in North America. Although the artifact inventory from the Bluefish Caves is presently too meager to permit the cultural classification of the occupants, the assemblage, as well as other indicators of human activity, is adequate to show the direct association of man with a diverse ungulate fauna during full-glacial times. In fact the association of the ungulates in a primary burial assemblage is an important contribution to ongoing controversy concerning the nature of the vegetation and landscape during the full-glacial interval.

In view of the numerous recently published summaries of later Beringian archaeological manifestations, we provide only a brief discussion of final Wisconsin and early Holocene sites and complexes. There are still too few well-stratified, well-dated, and well-published sites in eastern Beringia to provide a sound basis for reconstructing the role and response of human societies to the rapid, perhaps even chaotic, changes that took place in the final millennia of the Wisconsin. Dry Creek component I and the Chindadn complex at the Village site may contain part of the early history of the fluted point complexes that became widespread in North America during those millennia, but additional recent finds of fluted points themselves have not appreciably aided the resolution of the many questions that pertain to their origins.

Finally, we comment on a number of themes concerning the peopling of the New World including the concepts of migration and colonization, the importance of the Bering land bridge and the ice-free corridor, and the likely role of mankind in late Wisconsin extinctions.

Location: AEU SCI QE 720 W47, AEA PMA/ASA 560.45 P174
Area: Eastern Beringia, Yukon, Alaska
Topics: Human migration, Archaeological sites - Dry Creek, Archaeological sites - Bluefish Caves, Archaeological sites - Alaska, Archaeological sites - Trail Creek, Archaeological sites - Healy Lake, Archaeological sites - Gallagher Flint Station, Archaeological sites - Manis, Palaeontological sites - Old Crow, Palaeontological sites - Lost Chicken Creek, Palaeontological sites - Yukon, Taphonomy, Bone modification, Glacial history, Glacial lake sequences, Faunal remains, Plant macrofossils, Dating, Refugia, Pollen records, Vegetation history, Lithics, Cultural traditions, Megafauna, Lithic affinities, Archaeological sites - Diuktai Cave

Morlan, R. E., D. E. Nelson, T. A. Brown, J. S. Vogel, and J. R. Southon
1990 Accelerator Mass Spectrometry Dates on Bones from Old Crow Basin, Northern Yukon Territory. Canadian Journal of Archaeology 14:75-92.

Fifty-five radiocarbon dates have been obtained on 38 specimens of bone, antler, and tusk from the Old Crow region of northern Yukon Territory. The results strengthen chronological control on the local mid-Wisconsinan geological history and contribute to paleobiological studies of the taxa dated. Most of the dates were taken on bones that were altered when fresh in ways suggestive of tool production. We interpret the distribution of these samples as supporting the hypothesis that people lived in eastern Beringia during mid-Wisconsinan time.

Location: AEU PMC FC 65 C1152
Area: Yukon - northern, Eastern Beringia
Topics: Dating - AMS, Palaeontological sites - Old Crow, Faunal remains - *Bison*, Faunal remains - *Mammuthus*, Faunal remains - *Rangifer*, Geoarchaeology, Bone modification, Taphonomy

Nelson, D. E., R. E. Morlan, J. S. Vogel, J. R. Southon, and C. R. Harington
1986 New Dates on Northern Yukon Artifacts: Holocene Not Upper Pleistocene. Science 232:749-751.

New radiocarbon dates on four artifacts that were thought to provide evidence for human occupation of the Yukon Territory during the upper Pleistocene indicate that all four are of late Holocene age. The original radiocarbon age obtained for one artifact (the so-called "Old Crow flesher") was in error by almost 26,000 years.

Location: AEU SCI Q 1 S41
Area: Yukon - northern, Eastern Beringia
Topics: Palaeontological sites - Old Crow, Dating - AMS, Dating - radiocarbon, Faunal remains - Yukon, Faunal remains - *Rangifer tarandus*, Bone modification

Powers, W. R., and T. D. Hamilton
1978 Dry Creek: A Late Pleistocene Human Occupation in Central Alaska. In *Early Man in America from a Circum-Pacific Perspective*, edited by A. L. Bryan, pp. 72-77. Occasional Papers No 1 of the Department of Anthropology, University of Alberta. Archaeological Researches International, Edmonton, Alberta.

The Dry Creek site, discovered by C.E. Holmes in 1973, is located in central Alaska about 180 km southwest of Fairbanks. It occupies a late Pleistocene outwash terrace at the forest-tundra ecotone within the Nenana Valley, close to the north flank of the Alaska Range. The following discussion is based on preliminary fieldwork carried out in 1973 and 1974.

The archaeological components of the Dry Creek site are stratified within a two m section of eolian sediments and paleosols which overlie glacial outwash deposits. Text excavations here have isolated three cultural components of late Pleistocene age and one of Holocene age. Vertebrate fossils have been discovered in the two lowest components, and datable charcoal is present in most of the paleosols. The absence of severe postdepositional disturbance of the sediments has helped make Dry Creek an optimal locality for the study of human adaptation to late Quaternary environments in the North. Thus, among known Alaskan sites of this antiquity, Dry Creek is unique.

Notes: Abstract taken from introduction.
Location: AEU HSS GN 17 E12
Area: Alaska - central, Eastern Beringia
Topics: Archaeological sites - Dry Creek, Archaeological sites - Trail Creek, Archaeological sites - Onion Portage, Archaeological sites - Healy Lake, Archaeological sites - Gallagher Flint Station, Geoarchaeology, Loess, Palaeosols, Dating - radiocarbon, Lithics, Lithic affinities, Cultural traditions, Cultural traditions - Diuktai

Powers, W. R., and J. F. Hoffecker
1989 Late Pleistocene Settlement in the Nenana Valley, Central Alaska. American Antiquity 54:263-287.

Ongoing research in the Nenana Valley is uncovering a complex record of Late Glacial settlement in the foothills of the Alaska Range. A local eolian sequence provides relatively precise stratigraphic and chronological control, permitting integration with regional paleoclimatic history. Initial occupation seems to have occurred approximately 12,000 years ago, and is represented by several assemblages containing bifacial points. Microblade technology did not appear until ca. 10,500 B.P. The valley probably was exploited on a seasonal basis for large mammal procurement.

Location: AEU PMC CC 1 A6
Area: Alaska - central, Eastern Beringia, Kamchatka
Topics: Archaeological sites - Alaska, Lithics, Lithic affinities, Archaeological sites - Dry Creek, Archaeological sites - Healy Lake, Archaeological sites - Walker Road, Archaeological sites - Bluefish Caves, Archaeological sites - Trail Creek, Geoarchaeology, Glacial history, Loess, Palaeosols, Dating - TL, Refugia, Beringian environment, Pollen records - Alaska, Vegetation history - Alaska, Modern biogeography, Faunal remains - *Ovis dalli*, Faunal remains - *Cervus canadensis*, Faunal remains - *Bison priscus*, Faunal remains - *Mammuthus primigenius*, Faunal remains - *Equus caballus*, Faunal remains - *Rangifer tarandus*, Cultural traditions, Human migration, Archaeological sites - Lake Ushki, Archaeological sites - Berelekh

Reeves, B. O. K.
1983 Bergs, Barriers and Beringia: Reflections on the Peopling of the New World. In *Quaternary Coastlines and Marine Archaeology: Towards the Prehistory of Land Bridges and Continental Shelves*, edited by P. M. Masters and N. C. Flemming, pp. 389-411. Academic Press, New York, New York.

The debate on the time and entry of Early People into the New World generally focuses on the nature and extent of Western Canadian Ice Free Corridors - coastal, Cordilleran and interior - as the controlling mechanisms. The Late Wisconsin (*ca.* 20,000-14,000) glaciation was limited, in extent, and while the Cordillera was covered by an ice-dome, both coastal and interior routes were open. A 100-200 km wide corridor existed at the height of glaciation, from the unglaciated regions of the Central Yukon south along the entire western border of the interior plains and foothills to the unglaciated regions of the continental interior of the United States.

Rocky Mountain glaciers were very limited in extent, and did not advance beyond the mountain fronts. The corridor's environment appears to have been characterized throughout by a cold, dry steppe tundra capable of supporting Rancholabrean grazers and man. Man was present by this time in both Eastern Beringia and the unglaciated regions to the south, which indicates that man could have entered during Mid-Winconsin [sic] (54,000-20,000) and/or earlier non-glacial times - the Sangamon (*ca.* 120,000 years ago). Ice distributions and environments in Western Canada were at these times analogous [sic] to today's, and more than sufficient time was available to populate the entire Western Hemisphere by people resident in Eastern Beringia throughout the time period.

While the nature and extent of Early Wisconsin glaciation is poorly known, the Western Canadian corridors were effectively sealed by barriers of water and ice at the height of Late Pleistocene glaciation during Illinonian [sic] times (*ca.* 150,000 + years ago). It was during the close of this glaciation that the Rancholabrean fauna passed south through the open corridor with it steppe tundra environment on the freshly deglaciated and de-watered surfaces. Man, present in Eastern Beringia at that time, could have followed the herds south eventually reaching the continental interior.

Location: AEU HSS GN 741 Q22
Area: British Columbia - northeastern, Northwest Territories, Yukon, Eastern Beringia
Topics: Human migration, Ice-free corridor, Glacial history, Faunal associations, Glacial lake sequences

1985 Early Man in the Americas: Who, When, and Why. In *Woman, Poet, Scientist: Essays in New World Anthropology Honoring Dr. Emma Louise Davis*, edited by T. C. Blackburn, pp. 79-104. Ballena Press Anthropological Papers No. 29. Ballena Press/Great Basin Foundation Cooperative Publication, Los Altos/San Diego, California.

The timing, routes of entry, and cultures of the first peoples to penetrate the New World south of Beringia continues to be a source of divisive debate between proponents of a late glacial entry, less than 14,000 years ago and those who propose entries back to earlier non-glacial times, 20,000-50,000 B.P., or perhaps much earlier - 100,000 or more years ago.

The routes available for movement and their environmental characteristics, particularly for supporting man, differ markedly between glacial and non-glacial times. The latter, more or less analogous to today, provided sufficiently wide "windows" between ca. 20,000 and 50,000 years ago and in earlier times for early peoples, if present in Beringia, to gradually radiate down through the west coast, cordillera, and plains. If man arrived during these times, and the evidence I shall summarize indicates an entry before 30,000 years, the presence or absence of ice-free corridors during late glacial times along the coast or eastern Rocky Mountain slopes is irrelevant for the first peopling of America.

Notes: Abstract taken from introduction.
Location: AEU HSS E 61 W87
Area: Eastern Beringia
Topics: Human migration, Ice-free corridor, Palaeontological sites - Old Crow, Palaeontological sites - Lost Chicken Creek, Palaeontological sites - Yukon, Archaeological sites, Archaeological sites - Eastern Beringia, Archaeological sites - Trail Creek, Archaeological sites - Manis, Archaeological sites - Onion Portage, Archaeological sites - Gallagher Flint Station, Archaeological sites - Dry Creek, Archaeological sites - Tangle Lakes, Archaeological sites - Healy Lake, Archaeological sites - Bluefish Caves, Archaeological sites - Charlie Lake Cave, Archaeological sites - Zhoukoudian, Lithics, Lithic affinities, Bone modification, Dating, Cultural traditions, Faunal remains, Faunal associations

Roberts, A.
1984 Ice Free Corridor Paleoindian Survey. Current Research 1:15-17.

Location: AEA PMA/ASA
Area: British Columbia - northeastern, Eastern Beringia
Topics: Lithics, Human migration, Ice-free corridor

Rogers, R. A.
1985 Glacial Geography and Native North American Languages. Quaternary Research 23:130-137.

This study tests the hypothesis that the number and distribution of some native American languages may be related to ice-margin changes of the Wisconsin glaciation. The analysis indicated that the number of languages per unit area is much greater in unglaciated areas of the last glacial maximum than in glaciated areas. The pattern of language overlap between land areas sequentially exposed during deglaciation appears to indicate the direction of movement of populations from the periphery toward the core of the area once covered by the Wisconsin Ice Sheet. The data strongly indicate that North America was inhabited prior to the Wisconsin glacial maximum, because glacial maximum conditions apparently influenced linguistic distributions. Evidence suggests that ancestral Eskimo-Aleut and Na-Dene speakers occupied the northwestern edge of the continental ice mass, and that ancestral Algonquian speakers were south of the ice mass during the Wisconsin glacial maximum (approximately 18,000 yr ago). These three linguistic groups were the principal ones to spread into areas exposed by the recession of the Wisconsin ice.

Location: AEU SCI QE 696 Q24
Area: Eastern Beringia
Topics: Linguistics, Human migration, Glacial history, Refugia

1985 Wisconsinan Glaciation and the Dispersal of Native Ethnic Groups in North America. In *Woman, Poet, Scientist: Essays in New World Anthropology Honoring Dr. Emma Louise Davis*, edited by T. C. Blackburn, pp. 105-113. Ballena Press Anthropological Papers No. 29. Ballena Press/Great Basin Foundation Cooperative Publication, Los Altos/San Diego, California.

Wisconsinan glacial ice divided North America into Beringia (essentially an extension of Siberia) and a much larger area of unglaciated land south of the ice sheets. Two important pathways were available for human movement between Beringia and the area south of the continental ice. One was an interior route through an ice-free corridor to the east of the Cordillera. The other was a coastal route along the Northwest Coast to the west of the Cordillera. Fluctuations of ice margins during the Wisconsinan affected the possibilities of movement along either potential route. Some native American linguistic groups show a distribution that is consistent with the hypothesis that they were influenced by the Wisconsinan glaciation. Linguistic diversification is proportional to the amount of time an area was free from continental ice suggesting there was more time for languages to differentiate in unglaciated areas. This implies that some native North American linguistic traditions are at least as ancient as the Wisconsinan glacial maximum. Language complexity is relatively great along the Pacific Coast of North America, and much of the interior of the continent can be shown to have been inhabited by groups that have their maximum linguistic divergence (and thus a probable earlier homeland) on the Pacific Coast. The ice-free corridor area has very little linguistic diversity. This emphasizes the possible importance of the Pacific Coast in the movement of populations between Beringia and the area south of the continental ice. The Gulf Coast is also an area of marked linguistic divergence, although not as great as that on the West Coast. The linguistic data are consistent with the hypothesis that the bulk of the ancestors of the modern native speakers inhabited the coast prior to inhabiting the North American interior, and were probably earlier (leading to greater linguistic diversity) on the Pacific Coast than on the Atlantic Coast.

Location: AEU HSS E 61 W87
Area: Eastern Beringia
Topics: Linguistics, Human migration, Glacial history, Refugia, Ice-free corridor

Rogers, R. A., L. D. Martin, and T. D. Nicklas

1990 Ice-Age Geography and the Distribution of Native North American Languages. Journal of Biogeography 17:131-143.

Wisconsinan biogeographic zones and physical geographic barriers resulting from glaciation appear to have played a role in the distribution of native North American languages. A number of modern language families have distributions remarkably similar to those of Wisconsinan biogeographic zones. Wisconsinan glacial ice appears to have been an important isolating agent, leading to linguistic divergence. The end of the Wisconsinan was followed by the establishment of the radically different biogeographic zones of the Holocene and widespread retreat of continental glaciation. Evidence suggests that some language groups adapted more successfully than others to those new environmental conditions, and extended their ranges.

Location: AEU SCI G 1 J855
Area: Eastern Beringia
Topics: Linguistics, Human migration, Refugia, Glacial history, Faunal associations, Zoogeography, Vegetation history

Rogers, R. A., L. A. Rogers, R. S. Hoffmann, and L. D. Martin

1991 Native American Biological Diversity and the Biogeographic Influence of Ice Age Refugia. Journal of Biogeography 18:623-630.

The Wisconsin glaciation divided North America into a number of ice-free refugia for flora and fauna. Patterns of variation of certain North American mammalian species have been interpreted as a product of biological differentiation arising from isolation in these refugia. Recently, a tripartite biological and linguistic division of human populations in North America has been proposed by a number of researchers. The tripartite division in biological and linguistic traits correlates with three ice-free refugia that existed during the Wisconsin. These refugia would have provided the necessary isolation for the development of biologically and linguistically divergent groups. The human data can be seen as part of a broader pattern of glacial influences on biological variation among North American mammals.

Location: AEU SCI G 1 J855
Area: Eastern Beringia
Topics: Refugia, Human migration, Linguistics, Dentition, Human genetics, Zoogeography

Rouse, I.

1976 Peopling of the Americas. Quaternary Research 6:597-612.

Study of the prehistory of an Americas has proceeded through successive cycles, in which archaeologists have assumed or postulated hypotheses of migration and development, have searched for evidence with which to test these hypotheses, and have abandoned them when the evidence proved to be contradictory. We are completing the current cycle and must seek new hypotheses that better fit our present evidence.

The available data are reviewed to show the inaccuracy of the current hypotheses and to develop new ones. It is suggested that the first Indians arrived during a Lower Lithic age, marked by the manufacture of irregular flakes, trimmed only on their edges. This age may have started as early as 30,000 BP.

South of the Laurentide ice sheet, the Lower Lithic age began to give way about 14,000 BP to a Middle Lithic Age. This was marked by a variety of types of bifacially chipped projectile points which seem to have developed locally: Folsomoid points in Anglo-America, Joboid points in the Circum-Caribbean region, and Magelloid points in western and southern South America.

North of the ice sheet, the place of the Middle Lithic age was taken by an Upper Lithic age, marked by microblades of Asiatic origin. These appear to have reached the Bering Strait region about 14,000 BP. The dichotomy between the Middle and Upper Lithic ages lasted until the retreat of the ice ca. 8000 BP.

Location: AEU SCI QE 696 Q24
Area: Eastern Beringia, Western Beringia, Kamchatka
Topics: Human migration, Cultural traditions, Cultural traditions - Diuktai, Lithics, Lithic affinities, Archaeological sites - Eastern Beringia, Palaeontological sites - Old Crow, Archaeological sites - Lake Ushki, Archaeological sites - Anangula, Archaeological sites - Diuktai Cave, Archaeological sites - Onion Portage, Ice-free corridor, Archaeological studies - Eastern Beringia

Szathmary, E.

1985 Peopling of North America: Clues from Genetic Studies. In *Out of Asia: Peopling the Americas and the Pacific*, edited by R. Kirk and E. Szathmary, pp. 79-104. The Journal of Pacific History Inc., Canberra, Australia.

Location: AEU HSS E 61 O9
Area: Eastern Beringia
Topics: Human genetics, Human migration, Ice-free corridor, Linguistics, Cultural traditions, Palaeontological sites - Old Crow

Thorson, R. M., and R. D. Guthrie

1984 River Ice as a Taphonomic Agent: An Alternative Hypothesis for Bone "Artifacts". Quaternary Research 22:172-188.

The annual freezeup and violent breakup of temperate and high-latitude rivers produces unique geomorphic features that can be recognized in ancient sediments. The forces and materials involved in the breakup process could modify entrained bones in ways similar to those attributed to human activity. An intuitive taphonomic model is developed to explain how river ice may affect bones, and to predict the modifications expected. Partial testing of the model by experiments designed to simulate river breakup produced bone modifications such as fractures, flakes, facets, striations, isolated cuts, and polish. The taphonomic effects of river ice must be discounted prior to the interpretation of such features as human in origin.

Notes: Paper presented at the symposium "Taphonomic Analysis and Interpretation in North American Pleistocene Archaeology" held in Fairbanks, Alaska, April 1982.
Location: AEU SCI QE 696 Q24
Area: Alaska - northeastern, Eastern Beringia
Topics: Taphonomy, Bone modification, Palaeontological sites - Alaska, Palaeontological sites - Old Crow

West, F. H.

1975 Dating the Denali Complex. Arctic Anthropology 12(1):76-81.

Several recently-derived radiocarbon dates, principally from the Tangle Lakes district, yield the first creditable time brackets for the Denali complex of interior Alaska. Dates are suggested too for certain late Pleistocene-early Holocene events there. The Denali complex, as represented at the Site Mount Hayes III is dated to 10,150 B.P. ± 280. Its disappearance appears relatable to environmental change.

Location: AEU PMC GN 1 A68
Area: Alaska, Eastern Beringia, Kamchatka
Topics: Archaeological sites - Alaska, Archaeological sites - Tangle Lakes, Archaeological sites - Onion Portage, Archaeological sites - Lake Ushki, Lithics, Cultural traditions, Geoarchaeology, Palaeosols

1983 The Antiquity of Man in America. In *Late-Quaternary Environments of the United States Volume 1 The Late Pleistocene*, edited by S. C. Porter, pp. 364-382. University of Minnesota Press, Minneapolis, Minnesota.

Notes: H. E. Wright Jr. (series ed.).
Location: AEU SCI QE 696 L35
Area: Alaska, Eastern Beringia, Western Beringia, Kamchatka
Topics: Human migration, Archaeological studies - Eastern Beringia, Archaeological sites - Eastern Beringia, Archaeological sites - Trail Creek, Archaeological sites - Healy Lake, Archaeological sites - Dry Creek, Archaeological sites - Diuktai Cave, Archaeological sites - Berelekh, Archaeological sites - Lake Ushki, Palaeontological sites - Old Crow, Lithics, Lithic affinities, Faunal remains, Faunal associations, Faunal extinction, Vegetation history, Cultural traditions, Cultural traditions - Diuktai, Dating

1986 Old World Affinities of Archaeological Complexes from Tangle Lakes (Central Alaska). In *Beringia in the Cenozoic Era*, edited by V. A. Kontrimavichus, pp. 571-596. Russian Translation Series No. 28. A. A. Balkema, Rotterdam, The Netherlands.

Research over the past six years in the Tangle Lakes District of central Alaska resulted in the discovery of nearly 150 archaeological sites. The Tangle Lakes have been peopled sporadically, depending on the time of year, since settlement of the New World by man.

The paper discusses the earliest phases of settlement, to which two groups of early sites are assigned.

The first group, yet to be named, differs completely from the sites of group II and from all the other sites discovered so far in America. The sites of group I are characterized by bladelet cores, large choppers or flake cores and other recognizable classes of implements; large blades, as well as rough nuclei or choppers were also observed. There seem to be clear indications of Levalloisian technique. In total morphology the assemblages appear to be Mousterian-like or

Mousteroid, to use Müller-Beck's phrase. It may be concluded that the sites of group I are the earliest traces of hunters who first came to the New World across the Bering Land Bridge.

The second group of early Tangle Lakes sites is a series of 14 core and blade sites, of which all but two are clearly members of the Denali complex. Twelve are characterized by wedge-shaped microblade cores, which exhibit consistent technology. Donnelly burins, biconvex bifacial knives, and other elements. This complex may tentatively be dated to 8,000-10,000 years ago.

The Tangle Lakes seem to provide corroboration for the theories most emphatically stated by Müller-Beck, that the earliest settlement of the New World was accomplished by two waves of culture, the earlier generalized Middle Paleolithic or Mousteroid and the later generalized Upper Paleolithic or Aurignacoid.

Notes: Translation of *Beringiya v Kainozoe*, Vladivostok, 1976. Collection of papers presented at the All-Union Symposium "The Bering Land Bridge and its Role in the History of Holarctic Floras and Faunas in the Late Cenozoic" held at Khabarovsk in May, 1973.
Location: AEU POLAR 56:(*3) KON
Area: Eastern Beringia, Alaska - central
Topics: Lithics, Archaeological sites - Tangle Lakes, Lithic affinities, Geoarchaeology

Wilson, I. R.

1989 The Pink Mountain Site (HhRr-1): An Early Prehistoric Campsite in Northeastern B.C. Canadian Journal of Archaeology 13:51-67.

The Pink Mountain site, located in the eastern foothills of the Rocky Mountains in northern British Columbia, revealed artifacts suggestive of a 3,000 year time span extending to a fluted point occupation. The site appears to have been associated with a large proglacial lake. Comparisons of the artifacts with other northern and Rocky Mountain collections suggest affinities with Northern Cordilleran, Plano and Cody complex materials. Fluted points from the site are very similar to the specimen recovered from Charlie Lake Cave near Fort St. John. Microblade cores and macroblades were also recovered from the Pink Mountain site. Tentative associations between a microblade and, possibly, a macroblade industry and the fluted point technology are suggested.

Location: AEU PMC FC 65 C1152
Area: British Columbia - northeastern, Eastern Beringia
Topics: Archaeological sites, Archaeological sites - Charlie Lake Cave, Archaeological sites - Rocky Mountains, Lithics, Cultural traditions, Ice-free corridor, Glacial history, Glacial lake sequences, Lithic affinities

Workman, W. B.

1980 Holocene Peopling of the New World: Implications of the Arctic and Subarctic Data. Canadian Journal of Anthropology 1(1):129-139.

Major northern subsistence strategies developed *in situ* in final Pleistocene and Holocene times. Maritime hunting was fostered by the breakup of Beringia but only climaxed later. The roots of Northern Eskimo culture are to be found in Siberia 4000-5000 years ago with contributions from the North Pacific. Athapaskan boreal forest hunters derive ultimately from the northern plains while Algonquians may have been long resident in the eastern subarctic. Asiatic ideas spread to Holocene Alaskan coastal peoples with minimal impact on New World cultural history.

Location: AEU PMC GN 1 C22
Area: Eastern Beringia
Topics: Human migration, Beringian environment, Archaeological sites - Eastern Beringia, Archaeological sites - Dry Creek, Archaeological sites - Onion Portage, Archaeological sites - Tangle Lakes, Cultural traditions, Lithics

Wormington, H. M.

1983 Early Man in the New World: 1970-1980. In *Early Man in the New World*, edited by R. Shutler Jr., pp. 191-195. Sage Publications, Beverly Hills, California.

Location: AEU HSS E 61 E12
Area: Eastern Beringia
Topics: Dating - radiocarbon, Dating - AMS, Dating - amino acid, Dating - fission track, Human migration, Archaeological sites - Malta, Archaeological sites - Afontova Gora, Archaeological sites - Eastern Beringia, Archaeological studies - Eastern Beringia, Ice-free corridor, Lithics, Faunal extinction, Palaeontological sites - Old Crow, Bone modification

PART 6. MODERN BIOGEOGRAPHY

Anderson, P. M., and L. B. Brubaker

1986 Modern Pollen Assemblages from Northern Alaska. Review of Palaeobotany and Palynology 46:273-291.

Surficial sediments from 101 lakes in northern Alaska were analyzed for their pollen content. Isopoll maps of pollen percentages show that boreal forest, mixed forest-tundra, and tundra are characterized by distinctive pollen assemblages. Pollen spectra from boreal forest contain the highest percentages of spruce (*Picea*) and birch (*Betula*) pollen, forest-tundra samples have the highest frequencies of alder (*Alnus*) pollen, and tundra spectra contain the highest grass (Gramineae) and sedge (Cyperaceae) pollen percentages. In addition, vegetational variations within the tundra and boreal forest are evident in the modern pollen. Differentiation of pollen from spruce and birch species accurately indicates areas (in northcentral and northeastern Alaska) where white spruce (*P. glauca*) and paper birch (*B. papyrifera*) are common. The coastal tundra is distinguished from a more interior tundra by higher percentages of grass and heath (Ericales) pollen. The increased resolution of the vegetation-pollen relationships is, in part, a function of a sampling design that employs a broad grid of sample sites instead of using isolated sites or isolated transects. The insight gained from the modern study should help in interpreting fossil pollen records and provide a more detailed picture of the development of the modern boreal forest and tundra in northern Alaska.

Location: AEU SCI QE 901 R45
Area: Alaska - northern, Eastern Beringia
Topics: Pollen analysis - Alaska, Pollen analysis - modern pollen spectra, Modern biogeography

Birks, H. J. B.

1977 Modern Pollen Rain and Vegetation of the St. Elias Mountains, Yukon Territory. Canadian Journal of Botany 55:2367-2382.

The vegetation of the area east of the Klutlan Glacier in the St. Elias Mountains is described with the methods of European phytosociology. Four major vegetation types are recognized: *Picea glauca* forests, *Populus balsamifera* forests, *Betula glandulosa* shrub-tundra, and *Dryas integrifolia* tundra.

The modern pollen assemblages deposited in these vegetation types are determined by pollen analysis of surface moss polsters, lake muds, and moss samples from sedge swamps. Numerical analyses of the surface spectra indicate that spectra from the *Dryas* tundra and from the *Populus* forests are distinctive in their pollen composition. The variation in the percentage pollen content of samples from the *Picea* forests and the shrub-tundra is so great, even when spectra from a single sample type are considered, that no reliable distinctions can be made in modern pollen spectra from these two community types.

Location: AEU SCI QK 1 C21
Area: Yukon - southwestern, Eastern Beringia
Topics: Pollen analysis - Yukon, Pollen analysis - modern pollen spectra, Modern biogeography

Johnson, A. W., and J. G. Packer

1967 Distribution, Ecology, and Cytology of the Ogotoruk Creek Flora and the History of Beringia. In *The Bering Land Bridge*, edited by D. M. Hopkins, pp. 245-265. Stanford University Press, Stanford, California.

The arctic flora came into existence as a characteristic part of the world's flora during the late Tertiary, and by the beginning of the Quaternary a predominantly herbaceous perennial flora similar in composition to modern arctic floras existed throughout the North. Available fossil evidence and inferences based on the distribution and ecology of modern species suggest that the arctic flora was derived from species that had been associated with the high-latitude Arcto-Tertiary forest. They adapted themselves to local arctic-like conditions before they became widespread, from species that evolved *in situ* as the climate deteriorated during the late Tertiary, and from species that migrated into the Arctic, which were essentially pre-adapted to arctic habitats by virtue of alpine adaptations.

The influences of Quaternary events on this flora were not uniform. Although great portions of northern regions were glaciated, many areas were not, and palynological, phytogeographical, and cytological evidence points to the persistence of a flora much like that of today in unglaciated refugia, such as parts of Beringia. ...

Nearly all of the data available to us show that the Bering Strait has not been an effective barrier to arctic tundra plant dispersal. More than 90 per cent of the 300 species of angiospermous plants at Cape Thompson occur in Asia as well as in North America, ... On the other hand, the dissimilarity between arboreal floras of Asia and western North America suggests that the Bering Strait has prevented a commingling of forest species between the two continents for a relatively long time, probably since the Miocene or early Pliocene. In view of the frequent occurrence of a land bridge in the region during Quaternary times, it must be assumed that the barrier that prevented forest species from occupying the land-bridge surface was primarily climatic in nature.

... we envision a flat-to-slightly-undulating tundra plain whose primary plant constituents were lowland species — cottongrass, sedges, grasses, and moisture-tolerant herbs and low shrubs. The fact that the relatively small group of species (about 25) restricted to the American side of the Chukchi Sea is made up of upland species that never occur in meadowy habitats could be interpreted as supporting this reconstruction.

Notes: Based on a Symposium held at the VII Congress of the International Association for Quaternary Research (INQUA), Boulder, Colorado, 1965. Summary abbreviated for abstract.
Location: AEU SCI QE 39 H79
Area: Alaska - western
Topics: Refugia, Vegetation history - Beringia, Beringian vegetation, Genetics - plants, Biogeography

Kidd, J. G.

1988 Thaw Lake Development and its Effect on Plant Macrofossil Deposition. Current Research in the Pleistocene 5:50-52.

Location: AEA PMA/ASA
Area: Alaska - western, Eastern Beringia
Topics: Plant macrofossils, Periglacial features - thaw lakes, Taphonomy

Lausi, D., and P. L. Nimis

1985 Quantitative Phytogeography of the Yukon Territory (NW Canada) on a Chorological-Phytosociological Basis. Vegetatio 59:9-20.

This study is based on the analysis of the chorological spectra from 19 vegetation types obtained from a numerical classification of ca. 400 phytosociological relevés taken during a vegetation survey in the Yukon Territory (NW Canada).

All vegetation types are well characterized in terms of their chorological features. This allowed an ecological-historical interpretation of the vegetation in the study area. The distribution of the various chorological categories within the vegetation types is strongly correlated with the main environmental influences, whose action led to the present floristical and vegetational characteristics of the area, such as glaciation, fire, permafrost and water availability.

The results show how the phytosociological approach constitutes an effective methodological tool for clarifying the phytogeographical aspects in the historical-ecological interpretation of a large area.

Location: AEU SCI QK 1 V42
Area: Yukon, Eastern Beringia
Topics: Modern biogeography, Refugia

MacPherson, A. H.

1965 The Origin of Diversity in Mammals of the Canadian Arctic Tundra. Systematic Zoology 14:153–173.

The 17 modern Canadian arctic tundra mammals share only six broad patterns of taxonomic variation and geographic distribution. These are believed to result from differing distributions during the Wisconsin glacial stage, and the past distributions to have been in large part determined by the ecological relations of the species during the preceding interglacial stage. Those that were tundra species were able to maintain populations in the northern refugia, both in

Beringia and Pearyland if the species was widespread (e.g., varying lemming) and only in the former if confined to western North America (e.g., brown lemming). Tree-line species (e.g., caribou) gave rise to both woodland and tundra forms, the former from populations isolated south of the ice, and the latter from populations trapped in the cooling northern refugia. Other species maintained themselves only in Beringia (e.g., man), and others only south of the ice-sheets (e.g., wolverine). Two species, polar bear and arctic fox, find sea-ice no barrier to distribution, and their present ranges are of as little zoogeographical relevance as those of anadromous fish.

Location: AEU SCI QL 1 S99
Area: Eastern Beringia
Topics: Zoogeography, Faunal migration, Refugia, Glacial history

Nadler, C. F., and R. S. Hoffmann
1977 Patterns of Evolution and Migration in the Arctic Ground Squirrel, *Spermophilus parryii* (Richardson). Canadian Journal of Zoology 55:748-758.

Serum transferrins and 11 other genetically controlled proteins representing 17 loci were examined by starch-gel electrophoresis from Siberian, Alaskan, and Canadian populations of *Spermophilus parryii*. Six transferrin alleles were identified. Arctic populations (*S. p. parryii*, *S. p. osgoodi*) were characterized by *Tf 6* occurring alone or together with *Tf 7* whereas middle and subarctic populations exhibited *Tf 7* occurring either alone (*S. p. ablusus*, *S. p. lyratus*, *S. p. plesius*) or together with *Tf 5* (*S. p. plesius*). *Tf 8*, *Tf 9*, and *Tf 19* constituted local variants. *Tf 6* displayed a clinal distribution, increasing in frequency eastward and paralleling a clinal increase in body size. Three PGM_2 alleles were observed, the frequencies of which tend to differentiate arctic *S. p. parryii* from subarctic *S. p. ablusus*. *G6PD-b* occurred uniformly in North America and in one Siberian population; a second population (two specimens) exhibited *G6PD-a*, thereby suggesting that *G6PD* polymorphism may be present in Siberian *S. parryii*. The other nine proteins were monomorphic in all Holarctic populations.

Location: AEU SCI QL 1 C21
Area: Western Beringia, Eastern Beringia
Topics: Zoogeography - *Spermophilus parryii*, Genetics - *Spermophilus parryii*, Faunal migration, Refugia

Nadler, C. F., N. M. Zhurkevich, R. S. Hoffmann, A. I. Kozlovskii, L. Deutsch, and C. F. Nadler Jr.
1978 Biochemical Relationships of the Holarctic Vole Genera (*Clethrionomys*, *Microtus*, and *Arvicola* (Rodentia: Arvicolinae)). Canadian Journal of Zoology 56:1564-1575.

Transferrin (Tf), hemoglobin (Hgb), leucine aminopeptidase (LAP), 6-phosphogluconate dehydrogenase (6PGH), and glucose-6-phosphate dehydrogenase (G6PD) were examined by starch-gel electrophoresis in Holarctic *Microtus oeconomus* and *Clethrionomys rutilus*, Siberian *Microtus hyperboreus* and *Clethrionomys rufocanus*, and North American *Microtus miurus*, *Microtus ochrogaster*, *Microtus pennsylvanicus*, *Arvicola richarsoni*, and *Clethrionomys gapperi*. Thirty alleles of five to seven loci, the number depending on the presence or absence of one or two minor hemoglobin fractions, were identified in these species. Interspecific comparisons were based on the presence of at least one allele shared in common at the various loci. The closest biochemical resemblances occurred between populations of Holarctic *M. oeconomus* and *C. rutilus*. *Clethrionomys gapperi* and *C. rutilus* were quite similar but *C. rufocanus* was divergent. Observed resemblances between *M. hyperboreus* and *M. miurus* were not strong and do not support the inclusion of the former in the amphiberingian narrow-skulled vole group. *Arvicola richardsoni*, though seemingly close to *M. pennsylvanicus*, was quite divergent from all other species of *Microtus* in the LAP locus and warrants comparison with Palearctic *Arvicola*. *Microtus ochrogaster* and *M. pennsylvanicus* shared many similarities and served as reference samples.

Location: AEU SCI QL 1 C21
Area: Eastern Beringia
Topics: Zoogeography, Genetics - *Clethrionomys*, Genetics - *Microtus*, Genetics - *Arvicola*, Faunal migration

Ritchie, J. C., K. A. Hadden, and K. Gajewski
1987 Modern Pollen Spectra from Lakes in Arctic Western Canada. Canadian Journal of Botany 65:1605-1613.

Fifty-four samples of modern sediment from Banks Island and the Melville-Horton region of the Northwest Territories illustrate the major features of pollen deposition from the high to low arctic. Modern pollen deposition in the high arctic of Banks Island is characterized by up to 14% windblown tree pollen. Indicator taxa of the high and mid arctic include *Oxyria* (<5-23%), Saxifragaceae, *Saxifraga oppositifolia*, and Cruciferae (all up to 8%) and *Dryas* (up to 3%). Arboreal pollen increases to 60% in low-arctic and subarctic samples. Pollen concentration decreases from between 3 500 and 20 000 in the low arctic to less than 5 000 grains/cm^3 in the high and mid arctic. Pollen spectra from the Late Glacial of northwestern Canada differ from those of the modern high and mid arctic not only by the absence of trees and shrubs but also in the relative proportions of *Artemisia* and of such indicator taxa as *Oxyria* and Saxifragaceae.

Location: AEU SCI QK 1 C21
Area: Northwest Territories, Eastern Beringia
Topics: Pollen analysis - Northwest Territories, Pollen analysis - modern pollen spectra, Palynological sites - Lateral Pond

Steere, W. C.

1965 The Boreal Bryophyte Flora as Affected by Quaternary Glaciation. In *The Quaternary of the United States*, edited by H. E. Wright Jr. and D. G. Frey, pp. 485-495. Princeton University Press, Princeton, New Jersey.

The Quaternary glaciation had many effects upon the present bryophyte flora, as seen from subfossil materials and from several disjunct patterns of geographical distribution. Many species of mosses and hepatics have had little or no success in reinvading areas once covered by continental ice sheets whereas other species, in characteristic associations, have successfully colonized areas formerly glaciated. Emphasis has been placed on the bryophytes of boreal and arctic North America, because they are best known to the author. Several patterns of disjunct distributions of bryophytes are identified, as follows: (1) the high-arctic element probably survived at least part of the Quaternary at high latitudes in unglaciated areas; (2) a small element is typically found on calcareous silt, in which two endemic arctic species belong to genera characteristic of semiarid of steppe areas much further south; (3) a group of species characteristic of temperate or oceanic climates much further south is isolated on the unglaciated Arctic Slope of the Brooks Range, especially at Umiat; (4) an element of disjunct Asiatic species occurs; (5) species characteristic of warm climates are now found in Iceland only in the immediately vicinity of hot springs; (6) the anomalous distribution of *Bryoxiphium*, not found in areas most recently glaciated, is discussed; (7) some genera, as *Calliergon* and *Drepanocladus*, are most abundant in glaciated areas.

The various agents active in the dispersal of plants are reviewed, with a sympathetic feeling for the survival of many bryophytes during at least part of the Quaternary in unglaciated areas because of a precipitation level too low for the production of ice sheets. The importance of the new volcanic island emerging off the south coast of Iceland as a laboratory for biogeographers is stressed.

Notes: Summary used as abstract. A review volume for the VII INQUA Congress, Boulder and Denver.
Location: AEU SCI QE 77 W94
Area: Eastern Beringia, Alaska, Aleutian Islands
Topics: Biogeography - bryophytes

Vitt, D. H., D. G. Horton, and J. Pickard

1987 An Annotated List and the Phytogeography of the Bryophytes of Keele Peak, Yukon - An Isolated Granitic Mountain. Memoirs of the New York Botanical Garden 45:198-210.

One hundred and seventy-five species of mosses and 43 species of hepatics are recorded from Keele Peak. This isolated granitic mountain rises to 2974 meters elevation, and is located at 63°25'N, 130°20'W in the eastern Yukon Territory, Canada. About 45% of the moss flora of this acidic area is not found at calcareous sites in the Kluane-St. Elias and Nahanni-Liard ranges. Of the moss species found in these three areas, sixty-six are considered to be a part of the Beringian element. Of those, 33% are acidic species, 60% calcareous and 7% were not classified. It is suggested that during the Beringian arid glacial maxima, the calciphilic, arid-tolerant species expanded their ranges in association with arid, lowland steppes, while acidic moss species, most of which are largely less xerophytic, had reduced population sizes

and were restricted to isolated habitats. Seven mosses and one hepatic are reported new to the Yukon Territory, including *Trematodon laetevirens* new to North America and *Marsupella arctica*, new to western Canada.

Area: Yukon, Eastern Beringia
Topics: Biogeography - bryophytes, Refugia

SECTION C. WESTERN BERINGIA - SIBERIA

PART 1. GENERAL

Kind, N. V.

1967 Radiocarbon Chronology in Siberia. In *The Bering Land Bridge*, edited by D. M. Hopkins, pp. 172-192. Stanford University Press, Stanford, California.

Notes: Based on a Symposium held at the VII Congress of the International Association for Quaternary Research (INQUA), Boulder, Colorado, 1965.
Location: AEU SCI QE 39 H79
Area: Western Beringia, Siberia
Topics: Plant macrofossils - wood, Periglacial features - fossil ice wedges, Pollen records - Siberia, Faunal remains - *Mammuthus*, Climate history - Siberia, Glacial history - Siberia, Stratigraphy, Dating - analysis of radiocarbon dates

Sher, A. V.

1991 Problems of the Last Interglacial in Arctic Siberia. Quaternary International 10-12:215-222.

The basic problem in reconstructing the last interglacial in the Siberian Arctic is to recognize correlative deposits in the Quaternary sequence. Assignment of any particular "warm" event to the last interglacial is usually based on various indirect criteria. There is no one independent criterion that could distinguish the last interglacial from earlier or later warm periods. Potentially, the most rapidly evolved mammal lineage of collared lemmings could be helpful for dating the last interglacial in the Arctic, but there are still some problems to be solved. Another important problem is climatic interpretation of warm events presumably referred to the last interglacial. Most commonly such reconstructions are based on the concept of northward shift of modern-like plant communities. But some features of pollen spectra and insect faunas suggest a special character of communities existed during the warm events in the Arctic. They do not seem to be exact analogues of modern communities, and a nonuniformitarian approach is necessary for their climatic interpretation. Survival of tundra-steppe communities and grazing mammals through the last interglacial climatic change suggests that it was not so destructive for the Arctic ecosystems as the Pleistocene/Holocene environment restructuring.

Location: AEU SCI QE 696 A229
Area: Western Beringia, Siberia
Topics: Stratigraphy, Pollen records - Siberia, Periglacial features - fossil ice wedges, Faunal remains - Siberia, Climate history - Siberia, Vegetation history - Siberia, Sea level changes, Molluscs, Glacial history - Siberia, Faunal associations

PART 2. LATE QUATERNARY GEOLOGY

Arkhipov, S. A., L. L. Isayeva, V. G. Bespaly, and O. Glushkova
1986 Glaciation of Siberia and North-East USSR. Quaternary Science Reviews 5:463-474.

Notes: Special volume, *Quaternary Glaciations of the Northern Hemisphere*, edited by V. Sibrava, D. Q. Bowen, and G. M. Richmond. Report of IGCP Project 24.
Location: AEU SCI QE 696 Q245
Area: Siberia, Western Beringia
Topics: Review of glacial history - Western Beringia, Stratigraphy, Faunal remains - Siberia, Vegetation history - Siberia, Glacial geomorphology

Astakhov, V. I., and L. L. Isayeva
1988 The 'Ice Hill': An Example of 'Retarded Deglaciation' in Siberia. Quaternary Science Reviews 7:29-40.

The geological structure of one of the southernmost sites of thick ice beds in the Yenisei valley near the Arctic Circle is discussed. The erosion contacts of the foliated and contorted ice, abundance of glacial debris and the position between the basal till and ablation cover indicate a glacial origin for the ice layer. The ice occurs in the cores of arcuate accretion ridges built of ablation materials. The overlying sequence consists of a series of diamicton flows alternating with lacustrine and outwash sediments. Laterally the ice-rock complex changes into thick lacustrine rhythmites underlain by basal tills. The ice-containing hummocky terrain is often lower than the adjacent lacustrine plain. Therefore inversion of ice-controlled topography is suggested. Several stages of glaciokarst development are supposed to have occurred after an eastward moving ice lobe stagnated more than 50 ka BP. The main depositional events are associated with the Middle Weichselian draining of ice-dammed Lake Igarka, and with Early Holocene topographic inversion. The Holocene warming apparently caused diapiric deformation of the buried ice probably because of the density and thickness differences between the ice and the overburden.

The long history of burial and preservation of the remnants of basal glacier ice was controlled by Pleistocene permafrost. Landscape evolution in Northern Siberia is governed by such 'retarded deglaciation', in contrast with Atlantic environments. The thick ablation sequence may be described in terms of a Spitsbergen model, but the Siberian basal tills, because of their position within the permafrost, must be regarded as exfoliated layers of debris-rich ice according to Shantzer-Lavrushin's model. The occurrence of buried glacier ice and the mode of distribution of the permafrost shows the relict nature of the latter. In areas of modern and former retarded deglaciation intermittent diamicton flows are supposed to mark episodes of climatic amelioration like the Pleistocene and Holocene diamictons with driftwood at the 'Ice Hill'. Such 'warm' diamictons may account for some Early Holocene and similar puzzling interglacial 'ice advances'.

Location: AEU SCI QE 696 Q245
Area: Siberia - western, Western Beringia
Topics: Glacial history - Siberia, Glacial geomorphology, Stratigraphy, Plant macrofossils - wood, Climate history - Siberia, Glacial lake sequences, Periglacial features, Permafrost - ground ice

Baulin, V. V., and N. S. Danilova
1984 Dynamics of Late Quaternary Permafrost in Siberia. In *Late Quaternary Environments of the Soviet Union*, edited by A. A. Velichko, pp. 69-77. University of Minnesota Press, Minneapolis, Minnesota.

Among cryogenic processes most characteristic of the Late Pleistocene is frost cracking, and the ice-wedge-polygon traces are found over the entire USSR down to latitude 50°N. Neogenesis of frozen strata in loose deposits was accompanied by the formation of frost heaves; this process was especially typical in the western sector of the permafrost region. In mountainous areas, frost weathering of large rock fragments predominated, and stone fields and rock streams were formed. Judging from the thickness of involution horizons and the depth of occurrence of the "ice complex," the depth of seasonal thawing did not exceed 1 m, even in the southern regions of permafrost.

Notes: H. E. Wright Jr. and C. W. Barnosky (English-Language Edition eds.). Conclusions used as abstract.
Location: AEU SCI QE 696 L347 E5
Area: Siberia, Western Beringia
Topics: Stratigraphy, Permafrost, Periglacial features, Glacial history - Siberia, Climate history - Siberia

Belolyubsky, I. N.

1991 The Late Pleistocene of North-East Asia. In *INQUA, 13th International Congress, Beijing, China, Abstracts*, p. 22.

Area: Siberia, Western Beringia
Topics: Stratigraphy, Periglacial features - fossil ice wedges, Vegetation history - Siberia, Climate history - Siberia

Bespalyy, V. G.

1984 Late Pleistocene Mountain Glaciation in Northeastern USSR. In *Late Quaternary Environments of the Soviet Union*, edited by A. A. Velichko, pp. 31-33. University of Minnesota Press, Minneapolis, Minnesota.

Notes: H. E. Wright Jr. and C. W. Barnosky (English-Language Edition eds.).
Location: AEU SCI QE 696 L347 E5
Area: Siberia, Western Beringia
Topics: Glacial history - Siberia, Sea level changes, Glacial geomorphology

Dikov, N. N., and E. E. Titov

1984 Problems of the Stratification and Periodization of the Ushki Sites. Translated by D. B. Vitaliano. Arctic Anthropology 21(2):69-80.

Location: AEU PMC GN 1 A68
Area: Siberia - eastern, Western Beringia, Kamchatka
Topics: Geoarchaeology, Archaeological sites - Lake Ushki, Tephra - Lake Ushki, Lithics, Cultural traditions

Fominykh, L. A.

1991 History of Soil Formation in Late Pleistocene and Holocene on the North-East Asia Lowlands. In *INQUA, 13th International Congress, Beijing, China, Abstracts*, p. 99.

Area: Siberia - northeastern, Western Beringia
Topics: Soil, Periglacial features, Climate history, Stratigraphy

Hughes, T., and J. Fastook

1991 Constraints on Asian Migration into North America Imposed by Pleistocene Ice Sheets in Northeast Siberia. In *INQUA, 13th International Congress, Beijing, China, Abstracts*, p. 145.

Area: Siberia - northeastern, Western Beringia
Topics: Glacial history, Human migration

Isayeva, L. L.

1984 Late Pleistocene Glaciation of North-Central Siberia. In *Late Quaternary Environments of the Soviet Union*, edited by A. A. Velichko, pp. 21-30. University of Minnesota Press, Minneapolis, Minnesota.

Notes: H. E. Wright Jr. and C. W. Barnosky (English-Language Edition eds.).

Location: AEU SCI QE 696 L347 E5
Area: Siberia - north-central, Western Beringia
Topics: Glacial history - Siberia, Stratigraphy, Plant macrofossils, Molluscs, Glacial geomorphology, Pollen records - Siberia, Periglacial features, Sea level changes, Glacial lake sequences, Dating - analysis of radiocarbon dates

Kaplina, T. N., and A. V. Lozhkin
1984 Age and History of Accumulation of the "Ice Complex" of the Maritime Lowlands of Yakutiya. In *Late Quaternary Environments of the Soviet Union*, edited by A. A. Velichko, pp. 147-151. University of Minnesota Press, Minneapolis, Minnesota.

Notes: H. E. Wright Jr. and C. W. Barnosky (English-Language Edition eds.).
Location: AEU SCI QE 696 L347 E5
Area: Siberia - northern, Western Beringia
Topics: Permafrost, Stratigraphy, Plant macrofossils - wood, Plant macrofossils - peat, Pollen records - Siberia, Periglacial features, Glacial history - Siberia, Dating - analysis of radiocarbon dates

Konishchev, V. N.
1987 Origin of Loess-Like Silt in Northern Jakutia, USSR. GeoJournal 15(2):135-139.

Sediments of different lithological composition of a common feature - a relict system of thick syngenetic ice wedges - are called "ice complexes". Three types of ice complex are distinguished in N Jakutia, with different topographic roles. They formed in the second part of the Upper Pleistocene. Author found that it is not the matter of transportation that accounts for the formation of the main features of their composition, but the specifics of lithogenesis first of all determined by the conditions of cryogenic weathering.

Location: AEU SCI QE 1 G295
Area: Siberia, Western Beringia
Topics: Stratigraphy, Periglacial features, Sedimentology

Lebedeva, I. M., and V. G. Khodakhov
1984 Late Pleistocene Glacier Regimes and their Paleoclimatic Significance. In *Late Quaternary Environments of the Soviet Union*, edited by A. A. Velichko, pp. 55-65. University of Minnesota Press, Minneapolis, Minnesota.

Notes: H. E. Wright Jr. and C. W. Barnosky (English-Language Edition eds.).
Location: AEU SCI QE 696 L347 E5
Area: Western Beringia
Topics: Glacial dynamics, Glacial history, Climate history, Ice limit reconstruction

Petrov, O. M.
1967 Paleogeography of Chukotka During Late Neogene and Quaternary Time. In *The Bering Land Bridge*, edited by D. M. Hopkins, pp. 144-171. Stanford University Press, Stanford, California.

The Chukotka Peninsula was subjected to repeated marine transgressions during the Quaternary Period; these were evidently produced by the combined action of several factors, with tectonic movements playing the major role.

Chukotka suffered four glaciations during the Quaternary Period; the second glaciation, which was of Middle Quaternary age, was the most extensive and may have had the character of an ice sheet or a semi-ice sheet.

The first or Early Quaternary Glaciation and the second or Middle Quaternary Glaciation both coincided with marine transgressions. The Third (Vankarem) glaciation took place when sea level lay much lower than at present; and the fourth (Yskaten') took place when sea level was at its present position.

The development of the marine molluscan fauna of Bering Sea during Neogene and Quaternary time is characterized by successive increases in the role of cold-loving forms, culminating in the formation of an arctic faunal complex in

Middle Quaternary time. The role of the arctic elements has decreased since then, the fauna has become more boreal-arctic in character, and there has been a gradual approach in the composition of the faunas to that of the present time. In short, the history of the molluscan faunas records one wave of chilling that reached a peak in Middle Quaternary time.

Tundra vegetation appeared in Chukotka at the beginning of the Quaternary Period. Since then, there has been no forest but only forest tundra, during even the most optimal climatic conditions of the interglacials.

Notes: Based on a Symposium held at the VII Congress of the International Association for Quaternary Research (INQUA), Boulder, Colorado, 1965. Summary used as abstract.
Location: AEU SCI QE 39 H79
Area: Western Beringia, Siberia - eastern, Chukotka
Topics: Tectonism, Erratics, Sea level changes, Molluscs - marine, Stratigraphy, Pollen analysis - Siberia, Plant macrofossils - wood, Geomorphology - terraces, Diatoms, Dinoflagellates, Glacial history - Siberia

Péwé, T. L., A. Journaux, and R. Stuckenrath
1977 Radiocarbon Dates and Late-Quaternary Stratigraphy from Mamontova Gora, Unglaciated Central Yakutia, Siberia, U.S.S.R. Quaternary Research 8:51-63.

A fine exposure of perennially frozen ice-rich silt and associated flora and vertebrate fauna of late-Quaternary age exists at Mamontova Gora along the Aldan River in central Yakutia, Siberia, U.S.S.R. The silt deposit caps a 50-m-high terrace and consists of three units. An upper layer 1-2 m thick overlies a 10-15-m-thick brownish to black silt layer. The lower silt layer is greenish to gray and about 15 m thick. All the silt is well sorted with 60% of the particles falling between 0.005 and 0.5 mm in diameter and is generally chemically and mineralogically homogeneous. The middle unit contains may [sic] extinct vertebrate mammal remains and ice wedges. The lower unit contains little vegetation and no ice wedges. The silt is widespread and exists as a loamy blanket on terraces at various elevations on both sides of the lower Aldan River. The origin of the silt blanket of late-Quaternary age in central Yakutia has long been controversial. Various hypotheses have been suggested, including lacustrine and alluvial, as well as frost-action origins. It is sometimes referred to as loess-like loam. Péwé believes the silt at Mamontova Gora is loess, some of which has been retransported very short distances by water. The silt probably was blown from wide, braided, unvegetated flood plains of rivers draining nearby glaciers. The silt deposits are late Quaternary in age and probably associated with the Maximum glaciation (Samarov) and Sartan and Syryan glaciations of Wisconsinan age. On the basis of biostratigraphy, 10 radiocarbon dates, and their relation to the nearby glacial record, it is felt that the upper unit at Mamontova Gora is Holocene and the middle unit is Wisconsinan. The youngest date available from the middle unit at this particular location is 26,000 years. Dates greater than 56,000 years were obtained in the lower part of the middle unit. The lower unit is definitely beyond the range of radiocarbon dating and probably older than the last interglacial. The sediment, fauna, ice wedges, stratigraphy, and age of the perennially frozen slit [sic] deposits in central Alaska are remarkably similar to those of the deposits exposed in central Yakutia. Both areas consist of unglaciated rolling lowlands and river terraces surrounded by high mountains that were extensively glaciated in Pleistocene time. The glaciers extended from the high mountains to the edges of the ranges. In both regions, extensively braided, silt-charged rivers drained the mountains and flowed through the lowlands on their way to the sea. It follows that there should be a similar late-Quaternary history.

Location: AEU SCI QE 696 Q24
Area: Siberia, Western Beringia, Alaska - central, Eastern Beringia
Topics: Stratigraphy, Permafrost, Periglacial features, Plant macrofossils - wood, Plant macrofossils - peat, Sedimentology, Molluscs, Insect macrofossils, Faunal remains - *Mammuthus primigenius*, Faunal remains - *Equus caballus*, Faunal remains - *Bison priscus*, Faunal remains - *Citellus undulatus*, Faunal remains - *Microtus gregalis*, Faunal remains - *Lemmus sibiricus*, Faunal remains - *Dicrostonyx torquatus*, Dating - analysis of radiocarbon dates

Ranov, V. A.
1987 The Loessic Paleolith: A New Term in Paleolithic Terminology. Current Research in the Pleistocene 4:25-27.

Location: AEA PMA/ASA
Area: Western Beringia

Topics: Loess, Palaeosols, Lithics, Geoarchaeology, Terminology
Language: English with Russian translation on pp. 26-27.

Svitoch, A. A.

1986 Structure and Age of Marine Terraces of the Lower Anadyr Depression. Translated by R. Chakravarty. In *Beringia in the Cenozoic Era*, edited by V. L. Kontrimavichus, pp. 82-87. Russian Translation Series No. 28. A. A. Balkema, Rotterdam, The Netherlands.

Marine and lagoon-estuary terraces (50-60, 20-30 and 5-7 m high) with abrasiocumulative structures are widespread in the coastal zone of the Lower Anadyr depression. The foundations of the high terrace consist of marine deposits of the Krestovskaya suite and the glacial-marine deposits. According to thermoluminescent dating the age of the Krestovskaya suite deposits is 184,000 ± 22,000 years. Cumulative deposits (50-60 and 20-30 m) are represented by littoral and lagoon facies sediments of small thickness. According to absolute dating, the age of the deposits is 66,700 ± 4,200, 27,200 ± 2,200 and 39,000 ± 4,200 years. Strips of ice-laid deposits (51,000 ± 4,800 years) are preserved in the terrace structures. The low terrace is of cumulative origin and Mesoholocene age (radio-carbon datings; 7,010 ± 160 and 7,060 ± 200 years). At least four or five marks of levels higher than present sea level and separated by regression epochs have been established in the Middle Pleistocene/Mesoholocene deposits and geomorphological formations. During the epoch of low sea levels (ca. 50,000 years ago) the coastal zone of the depression was occupied by glaciers.

Notes: Translation of *Beringiya v Kainozoe*. Vladivostok, 1976. Collection of papers presented at the All-Union Symposium "The Bering Land Bridge and its Role in the History of Holarctic Floras and Faunas in the Late Cenozoic" held at Khabarovsk in May, 1973.
Location: AEU POLAR 56:(*3) KON
Area: Western Beringia
Topics: Sea level changes, Molluscs, Stratigraphy, Pollen records, Geomorphology - terraces, Dating - TL

Tomirdiaro, S. V.

1982 Evolution of Lowland Landscapes in Northeastern Asia During Late Quaternary Time. In *Paleoecology of Beringia*, edited by D. M. Hopkins, J. V. Matthews Jr., C. E. Schweger and S. B. Young, pp. 29-37. Academic Press, New York, New York.

Interfluve areas on the lowland plains of northeastern Siberia are a mosaic of small plateaus and hillocks (*yedoma*) separated or indented by depressions and basins (*alasy*). *Alasy* are thermokarst depressions formed by thawing of the ice-rich sediments of the *yedoma*. The *yedoma* sediments have customarily been interpreted as the products of late Pleistocene floodplain aggradation and accumulation in floodplain lakes. However, N. A. Shilo postulated as early as 1964 that the *yedoma* deposits must consist of perennially frozen loess of late Pleistocene age. The absence of channel sand and gravel, the absence of remains of fresh-water fauna, the obscure stratification, and the presence of syngenetic ice wedges all argue strongly against either a lacustrine or a floodplain origin for the *yedoma* sediments. The overwhelming predominance of silt in the very uniform, well-sorted *yedoma* sediment, the blanketing distribution as a cover on alluvial terraces of diverse ages and on rough bedrock relief, and the common presence of permeating vertical rootlets of herbaceous plants demonstrate that the *yedoma* loam is a windblown sediment. Lack of woody remains, presence of pollen spectra of the steppe-tundra type, and presence of a substantial carbonate and salt content indicate that the *yedoma* loam accumulated in a climate drier than the present one.

The *alasy* are a Holocene phenomenon. Presence in them of thaw lakes and lake sediments and thick peat layers testifies to a contrast between a relatively mild, humid, maritime Holocene climate and the much drier, more rigorously continental climate of the late Pleistocene. The evidence of a former cold, dry continental climate must mean that the late Pleistocene Arctic Ocean remained frozen even in summer. The abrupt shift to a much moister, more maritime Holocene climate resulted from the break-up of the perennial sea-ice cover when rising sea level admitted relatively warm Atlantic water into the Arctic Basin. Thermokarst lakes developed on the loess-ice plain ahead of the encroaching sea, causing a general irreversible reorganization and lowering of the late Pleistocene landscape.

Loess-ice plains, of which remnants persist as *yedoma* in northeastern Siberia, once stretched from western Europe across Siberia to Alaska. Holocene "alasification" has been a general process in unglaciated lowlands in the middle and northern latitudes, one that has been completed with the complete destruction of permafrost in eastern Europe and western Siberia but which is still in progress in northeastern Siberia and Alaska. The contrast between the present-day marshy and

lake-dotted lowland landscapes of northeastern Siberia and the dry, continental loess plains of eastern Europe is a strictly Holocene phenomenon. (Abstract by D.M.H.)

Notes: Translated from Russian by Dorothy Vitaliano.
Location: AEU SCI QE 720 W47, AEA PMA/ASA 560.45 P174
Area: Western Beringia, Siberia - northeastern
Topics: Terminology, Stratigraphy, Permafrost, Climate history - Siberia, Vegetation history - Siberia, Loess, Periglacial features, Plant macrofossils, Faunal remains - Siberia

1984 Periglacial Landscapes and Loess Accumulation in the Late Pleistocene Arctic and Subarctic. In *Late Quaternary Environments of the Soviet Union*, edited by A. A. Velichko, pp. 141-145. University of Minnesota Press, Minneapolis, Minnesota.

Notes: H. E. Wright Jr. and C. W. Barnosky (English-Language Edition eds.).
Location: AEU SCI QE 696 L347 E5
Area: Western Beringia
Topics: Periglacial features, Permafrost, Stratigraphy, Loess, Pollen records, Plant macrofossils

1986 Arctic Loess-Ice Plain as a Bridge between America and Asia and its Thermokarstal Disintegration in the Holocene. Translated by R. Chakravarty. In *Beringia in the Cenozoic Era*, edited by V. L. Kontrimavichus, pp. 96-110. Russian Translation Series No. 28. A. A. Balkema, Rotterdam, The Netherlands.

Rapid thermal disintegration of the high coasts of North Yakutia consisting of thick fossil ice began in the Holocene and is still observed today. Melting of the bottom of sea-cut fossil ice on the East Siberian shelf continues. These processes of unabating thermoabrasion and submarine thermokarst, and also the melting and deterioration of several icepack islands in the East Siberian Sea, show convincingly that the Upper Pleistocene loess-ice plain or the so-called "yedoma" which developed in North Yakutia, occupied vast areas of the shelf in the recent past. The plain was destroyed by the sea only in the Holocene without being flooded; this happened as a result of melting of subterranean ice exposed on the coast by waves. According to the author, the columns of frozen loess incorporated in the ice are of eolic origin. When they accumulated in the Upper Pleistocene, the thick ice shield of the Arctic Ocean provided a sharply continental climate and formation of landscapes with high-grass loess steppes even within the recent shelf and the islands of East Siberia. An intensive exchange of Upper Paleolithic theriofauna took place between Asia and America across the Arctic steppes.

Notes: Translation of *Beringiya v Kainozoe*. Vladivostok, 1976. Collection of papers presented at the All-Union Symposium "The Bering Land Bridge and its Role in the History of Holarctic Floras and Faunas in the Late Cenozoic" held at Khabarovsk in May, 1973.
Location: AEU POLAR 56:(*3) KON
Area: Siberia - northeastern, Western Beringia
Topics: Permafrost, Periglacial features - thermokarst, Loess, Stratigraphy, Glacial history, Faunal remains, Sea level changes, Sedimentology

Velichko, A. A.

1986 Methodological Approaches in the Investigation of the Development of Glaciation in Northern Eurasia. Quaternary Science Reviews 5:443-445.

Notes: Special volume, *Quaternary Glaciations of the Northern Hemisphere*, edited by V. Sibrava, D. Q. Bowen, and G. M. Richmond. Report of IGCP Project 24.
Location: AEU SCI QE 696 Q245
Area: Western Beringia
Topics: Glacial dynamics, Climate history

Velichko, A. A., L. L. Isayeva, V. M. Makeyev, G. G. Matishov, and M. A. Faustova
1984 Late Pleistocene Glaciation of the Arctic Shelf, and the Reconstruction of Eurasian Ice Sheets. In *Late Quaternary Environments of the Soviet Union*, edited by A. A. Velichko, pp. 35-41. University of Minnesota Press, Minneapolis, Minnesota.

Notes: H. E. Wright Jr. and C. W. Barnosky (English-Language Edition eds.).
Location: AEU SCI QE 696 L347 E5
Area: Western Beringia
Topics: Review of glacial history - Western Beringia, Glacial geomorphology, Glacial dynamics, Sea level changes, Ice limit reconstruction

PART 3. LATE QUATERNARY PALAEOENVIRONMENTS

Andreev, A. A.

1991 Vegetation and Climate of Yakutia During Late Pleistocene and Holocene. In *INQUA, 13th International Congress, Beijing, China, Abstracts*, p. 9.

Area: Siberia, Western Beringia
Topics: Vegetation history - Siberia, Climate history - Siberia

Colman, S. M., E. B. Karabanov, D. F. Williams, P. P. Hearn Jr., J. W. King, W. H. Orem, J. P. Bradbury, and W. C. Shanks III, G. A. Jones, and S. J. Carter

1992 Initial Dating and Paleoenvironmental Results from Lake Baikal, Southeastern Siberia. In *AMQUA, 12th Biennial Meeting, Davis, California, Program and Abstracts*, p. 66.

Area: Siberia - south-central, Western Beringia
Topics: Diatoms, Magnetic susceptibility, Pollen analysis - Siberia, Climate history - Siberia, Sedimentation rates

Frenzel, B.

1968 The Pleistocene Vegetation of Northern Eurasia. Science 161:637-649.

Location: AEU SCI Q 1 S41
Area: Western Beringia
Topics: Biogeography, Permafrost, Review of climate history - Western Beringia, Review of vegetation history - Western Beringia

Giterman, R.

1980 Vegetational History of the Eastern Soviet Arctic in the Pliocene and Pleistocene. In *5th International Palynological Conference, Cambridge, England, Abstracts*, p. 152.

Area: Western Beringia, Siberia - northeastern
Topics: Vegetation history - Siberia

Giterman, R. E.

1986 Kolyma Lowland Vegetation in the Pleistocene Cold Epochs and the Problem of Polar Beringia Landscapes. Translated by R. Chakravarty. In *Beringia in the Cenozoic Era*, edited by V. L. Kontrimavichus, pp. 214-220. Russian Translation Series No. 28. A. A. Balkema, Rotterdam, The Netherlands.

Numerous recent geological and paleontological data confirm the hypothesis of a continental connection between Asia and America in the Pleistocene. The Bering Land Bridge emerged during cold (glacial) times in the Pleistocene as a result of considerable lowering of the Arctic Ocean level (occasionally by 50-100 m lower than the recent level), when the territory of the recent continental shelf of the Laptev, East Siberian, Chukchi and Bering seas became dry. Two areas are distinguished in Beringia, namely the polar region, embracing the recent shelf of the northern seas, and the Pacific region, comprising the modern Bering Sea. The object of our investigation was the western part of Polar Beringia.

Palynological studies of faunistically characterized deposits, which were synchronous with the Lower-, Middle-, and Upper Pleistocene cold (glacial) epochs, give a picture of the vegetation that occupied the vast areas of Polar Beringia. These were rather peculiar periglacial landscapes, which existed under conditions of an extremely cold, dry climate and represented a combination of tundra, tundra-steppe, steppe and hypo-Arctic communities.

Despite all the seeming uniformity of periglacial plant cenoses, a definite trend toward changes, due to an increasingly continental climate, is observed during the Pleistocene. The changes manifested themselves in the lesser role of hypo-Arctic associations and greater areas being occupied by open tundra and steppe communities.

Notes: Translation of *Beringiya v Kainozoe*. Vladivostok, 1976. Collection of papers presented at the All-Union Symposium "The Bering Land Bridge and its Role in the History of Holarctic Floras and Faunas in the Late Cenozoic" held at Khabarovsk in May, 1973.
Location: AEU POLAR 56:(*3) KON
Area: Western Beringia
Topics: Vegetation history, Beringian vegetation, Pollen records, Climate history

Giterman, R. E., and L. V. Golubeva

1967 Vegetation of Eastern Siberia During the Anthropogene Period. In *The Bering Land Bridge*, edited by D. M. Hopkins, pp. 232-244. Stanford University Press, Stanford, California.

A comparison of our paleobotanical data on the periglacial vegetation in Siberia with descriptions of the vegetation during Pleistocene glaciations in Europe and America shows certain common features. The periglacial landscapes that prevailed during glacial episodes were very similar across great distances. The principal difference is that forest vegetation was more widely developed during glacial episodes in Europe and North America than in Siberia, evidently because of the intense continentality of the glacial climates in Siberia.

The vegetation during interglacial epochs in Eastern Siberia differed considerably both in its floristic composition and in the character of the vegetation formations from the interglacial vegetation of Europe and perhaps of America (paleobotanical material representing interglaciations is very rare in America). Broad-leaved deciduous tree species played only an inconsequential role in the interglacial vegetation formations of Eastern Siberia, and that only in the southern regions, such as Transbaikalia and Pribaikalia. ...

Notes: Based on a Symposium held at the VII Congress of the International Association for Quaternary Research (INQUA), Boulder, Colorado, 1965. Part of conclusions used as abstract.
Location: AEU SCI QE 39 H79
Area: Siberia, Western Beringia
Topics: Review of vegetation history - Western Beringia, Glacial history - Siberia, Pollen records - Siberia

Grichuk, V. P.

1971 The Analysis of Zonal Structure of the Pleistocene Vegetational Cover Across USSR. Pollen et Spores 13:101-116.

Vegetational zones variations on the USSR territory during the Pleistocene have been studied.

Location and size of the periglacial area somewhat changed with every glaciation but the plant-cover of this zone is characterized each time by an intensive deterioration of the forest formations and by a particular vegetation, zonal, of a periglacial type; forest-steppes and steppes developed extensively in the plains and tundra and alpine meadows in the mountains, indicating a very sharp increase in the continentality of the climate.

The ice sheet size and the mountain and valley glaciations were not determining factors in the formation of the climate of the glacial epoch, except in very restricted areas.

The latitudinal structure of the vegetational zones is preserved during the Pleistocene and if the zones boundaries vary during the glaciation epochs, during the interglacial on the other hand they are more similar to the present day location, which shows the stability of the poles since the very beginning of the Middle Pleistocene.

During each glacial epoch the plant-cover offers specific features which prove the influence of irregular factors along with the rhythmical factors of glaciation.

Notes: Summary used as abstract.
Location: AEU SCI QK 1 P77
Area: Western Beringia
Topics: Pollen records, Biogeography, Vegetation history, Glacial history, Climate history
Language: English with French abstract.

1984 Late Pleistocene Vegetation History. In *Late Quaternary Environments of the Soviet Union*, edited by A. A. Velichko, pp. 155-178. University of Minnesota Press, Minneapolis, Minnesota.

Notes: H. E. Wright Jr. and C. W. Barnosky (English-Language Edition eds.).
Location: AEU SCI QE 696 L347 E5
Area: Western Beringia
Topics: Biogeography, Pollen records, Review of vegetation history - Western Beringia, Review of pollen analyses - Western Beringia, Plant macrofossils, Refugia, Plant migration, Glacial history, Climate history

Grichuk, V. P., Y. Y. Gurtovaya, E. M. Zelikson, and O. K. Borisova

1984 Methods and Results of Late Pleistocene Paleoclimatic Reconstructions. In *Late Quaternary Environments of the Soviet Union*, edited by A. A. Velichko, pp. 251-260. University of Minnesota Press, Minneapolis, Minnesota.

Notes: H. E. Wright Jr. and C. W. Barnosky (English-Language Edition eds.).
Location: AEU SCI QE 696 L347 E5
Area: Western Beringia
Topics: Climate reconstruction, Climate history, Pollen records, Vegetation history, Plant macrofossils

Khotinskiy, N. A.

1984 Holocene Vegetation History. In *Late Quaternary Environments of the Soviet Union*, edited by A. A. Velichko, pp. 179-208. University of Minnesota Press, Minneapolis, Minnesota.

Notes: H. E. Wright Jr. and C. W. Barnosky (English-Language Edition eds.).
Location: AEU SCI QE 696 L347 E5
Area: Western Beringia
Topics: Review of vegetation history - Western Beringia, Pollen analysis, Climate history, Plant macrofossils - wood, Plant migration

Levkovskaja, G. M.

1980 Dynamics of the Vegetation and Climate in the Russian Plain, Western Siberia and Caucasus During the Palaeolithic (On Palynological Data). In *5th International Palynological Conference, Cambridge, England, Abstracts*, p. 221.

Area: Western Beringia, Siberia - western
Topics: Vegetation history - Siberia, Climate history - Siberia

Lozhkin, A. V.

1986 Late Pleistocene and Holocene Vegetation in Western Bering Land. Translated by R. Chakravarty. In *Beringia in the Cenozoic Era*, edited by V. L. Kontrimavichus, pp. 88-95. Russian Translation Series No. 28. A. A. Balkema, Rotterdam, The Netherlands.

Complex climatic fluctuations, expressed as repeated alternations of colder and warmer periods, are shown to have occurred in the northeastern part of Asian Continent during the period that followed the first large-scale Late Pleistocene interglaciation and extended over an interval of about 70,000 years. Generally these fluctuations coincided with climatic changes in other areas of the Northern Hemisphere.

The second Late Pleistocene (Karginsk-Khudzakhsk) warming of the climate began not later than 50,000 years ago. Two warming maxima established within that interval date to 44,000-41,000 and 32,000-24,000 years ago, respectively. The coolings noted within the Karginsk interval about 38,000-37,000 and 33,000 years ago were apparently separated by warmer time interval (ca. 35,000 years ago).

The cold interval (Sartansk-Inokchansk period), which began about 22,000 years ago, lasted approximately 10,000 years. Paleoclimatic datings show that noticeable warming began 8,500-8,000 years ago. That period was ostensibly

related to the general trend toward warming around 13,000-11,000 years ago. Climatic conditions close to recent ones developed over the territory of Western Bering Land about 2,500 years ago.

Late Pleistocene climatic changes resulted in shifts of the borderzones of the three main types of vegetation, viz. light-coniferous leafbearing forests, forest-tundra and tundra. In the warming intervals the forest borderzone was situated 150-200 km north of its present location.

Notes: Translation of *Beringiya v Kainozoe*. Vladivostok, 1976. Collection of papers presented at the All-Union Symposium "The Bering Land Bridge and its Role in the History of Holarctic Floras and Faunas in the Late Cenozoic" held at Khabarovsk in May, 1973.
Location: AEU POLAR 56:(*3) KON
Area: Western Beringia
Topics: Climate history - Western Beringia, Glacial history - Western Beringia, Vegetation history - Western Beringia, Pollen records - Western Beringia, Faunal remains - Western Beringia

Lozhkin, A. V., P. M. Anderson, W. R. Eisner, L. G. Ravako, D. M. Hopkins, L. B. Brubaker, P. A. Colinvaux, and M. C. Miller

1993 Late Quaternary Lacustrine Pollen Records from Southwestern Beringia. Quaternary Research 39:314-324.

Sediment cores from three lakes in the Upper Kolyma region, northeast Russia, provide the first well-dated continuous record of late Quaternary vegetation change from far southwestern Beringia. The oldest pollen zone, tentatively assigned to the Karginsk (mid-Wisconsinan) Interstade, indicates an *Artemisia* shrub tundra with *Pinus pumila*, *Betula*, and *Alnus* at mid- to low elevations. With the onset of the Sartan (late Wisconsinan) Stade, *Pinus* disappeared, probably indicating severely cold, dry winters and cool summers. As conditions deteriorated further, an *Artemisia*-Gramineae tundra developed. *Selaginella rupestris* and minor herb taxa indicate the presence of poor soils and disturbed ground. This herb tundra was replaced by a short-lived (< 1000 yr) *Betula-Alnus* shrub tundra followed by the rapid establishment of a *Larix dahurica* forest with a *Betula exilis*-ericales-lichen understory. *Populus suaveolens* and *Chosenia* may have formed limited hardwood gallery forests at this time. Modern vegetation associations probably developed during the early Holocene with the arrival of *Pinus pumila* ca. 9000 yr B.P. This shrub became important in the forest understory and, with *B. exilis*, formed a belt of shrub tundra beyond altitudinal treeline. Comparison of the Upper Kolyma and Alaskan pollen records indicates that important differences in vegetation types and timing of vegetation change occurred across Beringia during the late Quaternary.

Location: AEU SCI QE 696 Q24
Area: Western Beringia, Siberia - eastern
Topics: Faunal remains - Siberia, Plant macrofossils, Insect macrofossils - beetles, Tephra - Beringia, Dating - analysis of radiocarbon dates, Palynological sites - Jack London Lake, Palynological sites - Sosednee Lake, Palynological sites - Rock Island Lake, Palynological sites - Old Camp Lake, Palynological sites - Joe Lake, Palynological sites - Sands of Time Lake, Pollen analysis - Siberia, Vegetation history - Siberia, Climate history - Siberia

Matthews Jr., J. V.

1974 Fossil Insects from the Early Pleistocene Olyor Suite (Chukochya River: Kolymian Lowland, U.S.S.R.). Geological Survey of Canada Paper 74-1 Part A:207-211. Geological Survey of Canada, Ottawa, Ontario.

Location: AEU SCI QE 185 C2
Area: Western Beringia, Siberia - northern
Topics: Insect macrofossils - beetles

Nazarov, V. I.

1991 Late Pleistocene Insects from Hanka Lake Deposits. In *INQUA, 13th International Congress, Beijing, China, Abstracts*, p. 251.

Area: Siberia - southeastern, Western Beringia
Topics: Insect macrofossils, Zoogeography - insects, Climate history

Savvinova, G. M.

1986 Pleistocene and Holocene Vegetation on the Upper Reaches of the Indigirka and Kolyma Rivers. Translated by R. Chakravarty. In *Beringia in the Cenozoic Era*, edited by V. L. Kontrimavichus, pp. 211-213. Russian Translation Series No. 28. A. A. Balkema, Rotterdam, The Netherlands.

Study of the problem of the Bering Land Bridge led us to elucidate the age of alluvial deposits in the Indigirka and Kolyma riverheads. Thus Lower Quaternary vegetation is characterized by distribution of fir-pine forests with admixtures of larch, cedar bushes (*Pinus pumila*) and birch. Individual specimens of *Tsuga*, *Carya*, *Corylus* and *Abies* were also found. Sporophytes predominated in the vegetation of glacial epochs. In interglacial periods sparse forest vegetation existed, and vast areas were occupied by shrubs and herb-moss cover. The Early Holocene was characterized by rare pine and larch trees surrounded by alder thickets, as well as incipient distribution of fir, cedar bush, birch and willow trees.

Notes: Translation of *Beringiya v Kainozoe*. Vladivostok, 1976. Collection of papers presented at the All-Union Symposium "The Bering Land Bridge and its Role in the History of Holarctic Floras and Faunas in the Late Cenozoic" held at Khabarovsk in May, 1973.
Location: AEU POLAR 56:(*3) KON
Area: Western Beringia, Siberia
Topics: Vegetation history - Siberia, Pollen records - Siberia

Velichko, A. A.

1984 Late Pleistocene Spatial Paleoclimatic Reconstructions. In *Late Quaternary Environments of the Soviet Union*, edited by A. A. Velichko, pp. 261-285. University of Minnesota Press, Minneapolis, Minnesota.

Notes: H. E. Wright Jr. and C. W. Barnosky (English-Language Edition eds.).
Location: AEU SCI QE 696 L347 E5
Area: Western Beringia
Topics: Climate reconstruction, Loess, Climate history, Glacial history, Periglacial features, Palaeowinds

Volkova, V.

1980 West Siberian Landscapes in the Epoch of Late Zyryanian Glaciation. In *5th International Palynological Conference, Cambridge, England, Abstracts*, p. 418.

Area: Siberia - western, Western Beringia
Topics: Vegetation history - Siberia, Glacial history - Siberia, Climate history - Siberia

PART 4. LATE QUATERNARY PALAEONTOLOGY

Agadzhanyan, A. K.

1986 The History of Collared Lemmings in the Pleistocene. Translated by R. Chakravarty. In *Beringia in the Cenozoic Era*, edited by V. L. Kontrimavichus, pp. 379-388. Russian Translation Series No. 28. A. A. Balkema, Rotterdam, The Netherlands.

A rich collection of small mammalian bones was obtained during a complex study of Pleistocene deposits in the Russian Plains, Siberia and Yakutia. The material enabled reconstruction of development of the dentition of collared lemming during the Late Pleistocene. Sites of Middle Pleistocene lemmings were discovered in sands under the Dnieper (Ryss) moraine. Upper Pleistocene lemmings were found in fluvio-glacial deposits dating to the Valday (Wurm). Recent lemmings have been studied from materials of Eurasia, Alaska and Canada. A specific intrapopulational change, comprising different morphotypes of tooth structure, was established for each evolutionary stage of *Dicrostonyx*. Transformation of one species into another occurs by way of replacement of the dominant morphotype. *D. simplicior* Fejfar and the recent *D. hudsonius* Pallas had teeth with the most closely resembling features. Hence *D. hudsonius* Pallas is probably a relict of the Middle Pleistocene. An analysis of the evolution of collared lemmings from the Pleistocene to the Holocene shows that close affinities existed between the populations of North America and North Asia in the Early, Middle and Late Pleistocene.

Notes: Translation of *Beringiya v Kainozoe*. Vladivostok, 1976. Collection of papers presented at the All-Union Symposium "The Bering Land Bridge and its Role in the History of Holarctic Floras and Faunas in the Late Cenozoic" held at Khabarovosk in May, 1973.
Location: AEU POLAR 56:(*3) KON
Area: Siberia, Western Beringia
Topics: Zoogeography - *Dicrostonyx*, Faunal remains - *Dicrostonyx*, Faunal remains - *Citellus*, Faunal remains - *Lemmus*, Faunal remains - *Microtus*, Palaeontological sites - Western Beringia, Faunal migration, Zoogeography - microtine rodents, Palaeontological sites - Cape Deceit

Dubrovo, I.

1990 The Pleistocene Elephants of Siberia. In *Megafauna and Man: Discovery of America's Heartland*, edited by L. D. Agenbroad, J. I. Mead and L. W. Nelson, pp. 1-8. Scientific Papers Volume 1. The Mammoth Site of Hotsprings, South Dakota, Inc. and Northern Arizona University, Hot Springs, South Dakota and Flagstaff, Arizona.

Siberia has proboscidean fossil remains of *Paleoloxodon*, *Archidiskodon* and *Mammuthus*. Only the latter two genera migrated to North America. Evidence from Yakutia and western North America indicate *Archidiskodon* was the ancestral mammoth of North America, arriving not earlier than 1.7 to 2million [sic] yr B.P. The woolly mammoth (*Mammuthus primigenius*) is known throughout Siberia and northern North America. In Eurasia, early and late forms of *M. primigenius* are recognized. It is the late form that migrated to North America. The Soviet Union has approximately 50 localities where soft tissue remains of Pleistocene fauna have been preserved in permafrost. Mammoth soft tissue remains date from approximately 50,000 to 10,000 million [sic] yr B.P. We know the shape of ears and trunks of *M. primigenius* from these localities. We also have preserved hair and even stomach and intestinal contents. International cooperative research is needed on the migration of elephants from Asia to North America.

Location: AEU HSS QE 745 M496
Area: Siberia, Western Beringia
Topics: Faunal remains - *Mammuthus primigenius*, Faunal remains - *Ovibos moschatus*, Faunal remains - *Coelodonta antiquitatis*, Faunal migration, Palaeontological sites - Western Beringia, Zoogeography - *Mammuthus*, Megafauna, Taphonomy, Stratigraphy, Archaeological sites - Berelekh

Heintz, A. E., and V. E. Garutt

1965 Determination of the Absolute Age of the Fossil Remains of Mammoth and Woolly Rhinoceros from the Permafrost in Siberia by the Help of Radio Carbon (C_{14})*. Norsk Geologisk Tidsskrift 45:73-79.

Six samples of mammoth and one of woolly rhinoceros from the permafrost in Siberia were determined by the help of radio carbon (C_{14}) in Laboratoriet for Radiologisk Datering in Trondheim, Norway. The determined age varies in five of the mammoth samples and the rhinoceros sample from 44,000 ± 3,500 to 33,500 ± 1,000 years. However, one of the samples of mammoth (from Tajmyr) was considerably younger - 11,450 ± 250 years old.

Notes: *Slightly changed translation by one of the authors (A. E. Heintz) of the Russian article, published in <<Доклады Академии Наук>> СССР, 1964, Tom 154, No. 6, pp. 1367-1370.
Location: AEU SCI QE 1 N86
Area: Siberia, Western Beringia
Topics: Faunal remains - *Mammuthus primigenius*, Faunal remains - *Coelodonta antiquitatis*, Dating - radiocarbon, Climate history - Siberia, Megafauna

Kasparov, A. K.

1991 Mammal Remains from Paleolitic [sic] Sites in the Enisei Upstreeams [sic]. In *INQUA, 13th International Congress, Beijing, China, Abstracts*, p. 160.

Area: Siberia, Western Beringia
Topics: Palaeontological sites - Siberia, Faunal remains - *Lepus*, Faunal remains - *Vulpes vulpes*, Faunal remains - *Canis lupus*, Faunal remains - *Gulo gulo*, Faunal remains - *Equus hemionus*, Faunal remains - *Cervus elaphus*, Faunal remains - *Alces alces*, Faunal remains - *Capreolus pygargus*, Faunal remains - *Bison priscus*, Faunal remains - *Ovis ammon*, Faunal remains - *Capra sibirica*, Faunal remains - birds, Faunal remains - *Lepus tolai*, Faunal remains - *Marmota*, Faunal remains - *Alopex lagopus*, Faunal remains - *Poëphagus*, Faunal remains - *Coelodonta antiquitatis*, Faunal remains - *Rhinoceros*

Lazarev, P. A.

1985 Finds of Mammoth Fauna Remains in the Area of the Lower Indigirka River Northern Yakutia. Current Research in the Pleistocene 2:103-104.

Location: AEU HSS E 61 C97
Area: Siberia - eastern, Western Beringia
Topics: Palaeontological sites - Western Beringia, Stratigraphy, Faunal remains - *Mammuthus*, Faunal remains - *Bison*, Faunal remains - *Equus*, Faunal remains - *Rangifer tarandus*, Faunal remains - *Gulo*, Archaeological sites - Berelekh

1991 Mammoth Finds in the Late Pleistocene of Yakutia (North-East Asia). In *INQUA, 13th International Congress, Beijing, China, Abstracts*, p. 187.

Area: Siberia, Western Beringia
Topics: Faunal remains - *Mammuthus*, Palaeontological sites - Siberia, Palaeontological sites - Berelekh

Lister, A. M.

1993 Mammoths in Miniature. Nature 362:288-289.

Location: AEU SCI Q 1 N28
Area: Siberia - northeastern, Western Beringia, Wrangel Island
Topics: Palaeontological sites - Wrangel Island, Faunal remains - *Mammuthus primigenius*, Vegetation history - Siberia, Zoogeography - *Mammuthus primigenius*, Palaeontology

Sher, A. V.

1968 Fossil Saiga in Northeastern Siberia and Alaska. International Geology Review 10:1247-1260.

Occurrences of fossil saiga from the Kazakhstan steppes to the Arctic Far East and Alaska indicate that the Pleistocene form, as Recent saiga, favored areas of level terrain with a thin snow cover and dry climate. *Saiga ricei* Frick is partially redescribed and several occurrences cited.

Location: AEU SCI QE 1 I612
Area: Siberia, Western Beringia, Alaska, Eastern Beringia
Topics: Palaeontological sites - Western Beringia, Faunal remains - *Saiga tatarica*, Faunal remains - *Saiga ricei*, Faunal remains, Beringian ecology, Zoogeography - *Saiga*, Palaeontological sites - Alaska, Stratigraphy, Pollen records, Faunal migration, Archaeological sites - Afontova Gora, Archaeological sites - Kokorevo

1974 Pleistocene Mammals and Stratigraphy of the Far Northeast USSR and North America. Translated by D. Vitaliano. International Geology Review 16 Supplement:1-284.

Notes: A comprehensive review.
Location: AEU SCI QE 1 I612
Area: Western Beringia
Topics: Review of stratigraphy - Western Beringia, Review of faunal remains - Western Beringia, Faunal associations, Faunal migration, Beringian environment, Pollen analysis, Vegetation history, Plant macrofossils, Palaeontological sites - Western Beringia, Palynological sites - Western Beringia

Ukraintseva, V. V.

1985 Forage of the Large Herbivorous Mammals of the Epoch of the Mammoth. Acta Zoologica Fennica 170:215-220.

Plant remains from gastrointestinal tracts of a horse, bison and mammoths which died in Siberia during different periods of the Pleistocene and Holocene are described. Dominant during warm periods were plants of moist and swampy habitats: sedge, cotton grasses and mosses with lower content of proteins, albumins, fats and mineral substances as compared with plants of dry habitats and meadow forbs. Seasonal dynamics of nutrient and mineral substances was of vital importance for both extinct and living animals. The seasonal dynamics of the cold periods might be different from that of the warm, although more favourable for big herbivores which need plenty of proper forage. Both summer and winter death rates of the mammals considerably increased during the warm periods which eventually led to the extinction of some animals (mammoth, wolly [sic] rhinoceros) and reduction of the Siberian ranges of other (*Bison*, *Ovibos*, *Saiga*). There were a number of causes which brought about the extinction of mammoths and were due to fluctuations of the Pleistocene and Holocene environment; the animals proved incapable of adapting themselves to drastic changes of the latter.

Location: AEU POLAR 05 A188
Area: Western Beringia, Siberia
Topics: Palaeontological sites - Western Beringia, Plant macrofossils, Pollen records - Siberia, Vegetation history - Siberia, Faunal extinction, Faunal remains - Siberia

Vartanyan, S. L., V. E. Garutt, and A. V. Sher

1993 Holocene Dwarf Mammoths from Wrangel Island in the Siberian Arctic. Nature 362:337-340.

The cause of extinction of the woolly mammoth, *Mammuthus primigenius* (Blumenbach), is still debated. A major environmental change at the Pleistocene-Holocene boundary, hunting by early man, or both together are among the main explanations that have been suggested. But hardly anyone has doubted that mammoths had become extinct everywhere by around 9,500 years before present (BP). We report here new discoveries on Wrangel Island in the Arctic Ocean that force this view to be revised. Along with normal-sized mammoth fossils dating to the end of the Pleistocene, numerous teeth of dwarf mammoth dated 7,000-4,000 yr BP have been found there. The island is thought to have become separated from the mainland by 12,000 yr BP. Survival of a mammoth population may be explained by local topography and climatic features, which permitted relictual preservation of communities of steppe plants. We interpret the dwarfing of the Wrangel mammoths as a result of the insularity effect, combined with a response to the general trend towards unfavourable environment in the Holocene.

Location: AEU SCI Q 1 N28
Area: Siberia - northeastern, Western Beringia, Wrangel Island
Topics: Palaeontological sites - Wrangel Island, Faunal remains - *Mammuthus primigenius*, Vegetation history - Siberia

Vereshchagin, N. K.
1974 The Mammoth "Cemetaries" of North-East Siberia. Polar Record 17(106):3-12.

Location: AEU SCI G 575 P75
Area: Siberia - northern, Western Beringia
Topics: Palaeontological sites - Siberia, Archaeological sites - Berelekh, Faunal remains, Faunal remains - *Mammuthus*, Beringian environment, Faunal extinction, Plant macrofossils, Loess, Vegetation history - Siberia, Taphonomy

Vereshchagin, N. K., and G. F. Baryshnikov
1982 Paleoecology of the Mammoth Fauna in the Eurasian Arctic. In *Paleoecology of Beringia*, edited by D. M. Hopkins, J. V. Matthews Jr., C. E. Schweger and S. B. Young, pp. 267-279. Academic Press, New York, New York.

An analysis of the morphology and ecology of the late Pleistocene mammoth fauna of arctic Eurasia indicates that they lived in a cold, dry climate in steppe and steppe-tundra biotopes and landscapes characterized by hard, frozen ground. The decimation of the mammoth fauna came as a result of temperature increases during interstades within the Valdai (i.e.,Würmian of Europe, Wisconsin of North America) cold interval and the establishment of taiga and tundra vegetation at the end of this interval. The animals surviving the ecological catastrophe at the end of the Pleistocene (e.g., reindeer, arctic fox, marmot, souslik ground squirrel, and lemming) were able to persist in the severe conditions of present-day tundra as a result, in some cases, of their capacity for long migrations and, in others, of physiological adaptations that enabled them to cope with deep snow and occasional winter thaws.

Location: AEU SCI QE 720 W47, AEA PMA/ASA 560.45 P174
Area: Western Beringia
Topics: Faunal remains, Faunal remains - *Mammuthus primigenius*, Faunal remains - *Equus lenensis*, Faunal remains - *Coelodonta antiquitatis*, Faunal remains - *Bison priscus*, Faunal remains - *Poëphagus*, Faunal remains - *Ovibos moschatus*, Faunal remains - *Saiga tatarica*, Faunal remains - *Panthera spelaea*, Faunal remains - *Rangifer tarandus*, Faunal remains - *Citellus*, Faunal remains - *Lemmus*, Faunal remains - *Dicrostonyx*, Faunal remains - *Microtus gregalis*, Faunal remains - *Alopex lagopus*, Zoogeography, Faunal associations, Megafauna, Palaeontological sites - Western Beringia, Taphonomy, Faunal extinction, Vegetation history, Climate history, Insect macrofossils

1984 Quaternary Mammalian Extinctions in Northern Eurasia. In *Quaternary Extinctions - A Prehistoric Revolution*, edited by P. S. Martin and R. G. Klein, pp. 483-516. University of Arizona Press, Tucson, Arizona.

Analysis of the geography and ecology of extinct and declining Quaternary mammals in the USSR shows clearly that four groups or factors led to the destruction of the mammoth fauna and to the disappearance of a series of other species:

1. Changes in environment, including seasonal and secular climatic oscillations, involving changes in landscapes and biotopes. Here we include tectonic uplift and fluctuation in the level of the world ocean, which not only altered atmospheric circulation, but also weakened natural selection pressures in circumstances of insular and peninsular isolation.

2. The loss by species of resistance and of the ability to adapt quickly to new abiotic and biotic environmental conditions. Here we are talking about ecogenetic and phylogenetic defects, including the concept of excessive specialization and the nonadaptative character of evolution.

3. The disruption of population structure as a result of external factors such as more progressive competitors, carnivores, parasites, epizootic diseases, and stressful situations.

4. The direct destructive influence of people and the indirect action of their economic activity on exploited and unexploited animal species.

Once we postulate these groups of factors, the next step is to evaluate the relative weight of each in time and space, that is, in different stages and geographic zones.

The examples we have presented of extremely rapid decline in some nonexploited mammal species during the Quaternary and at present in northern Eurasia point to the supreme importance of external, abiotic environmental factors in their extinction. The nearly total extinction of large species of the mammoth fauna in the tundra and taiga zones and their partial survival in the forest steppe and steppe confirms the decisive effects of climatic and landscape changes for the life and death of this species group.

The best proof of what has been said is the ubiquitous transformation of the Upper Pleistocene "steppe" fauna into a forest and taiga fauna over huge areas of upper and middle latitudes in Eurasia. In this case, the primitive species were not crowded out by more progressive ones, nor were their population structures disrupted, nor were they destroyed by human activity. Environmental change was so radical and dramatic that morphological evolution simply did not have time to catch up.

The destructive activity of people is often thought to have been decisive in the extinction of Quaternary giants (mammoth, rhinoceros, cave bear, and others). However, while human influence on animal populations steadily increased in prehistory, it became definitive only in the last few millenia [sic] and centuries. In addition, the role of man has not been the same in all geographic zones. It has been greatest in the ancient heartlands of civilization in the Mediterranean Basin, western and central Asia, and China, and least in the polar desert.

The remaining causes of extinction have apparently been secondary, merely promoting further reduction in ranges and numbers of species after they had suffered from climatic and landscape changes or from human pressures.

Notes: Conclusion used as abstract. A comprehensive review with extensive faunal lists.
Location: AEU SCI QE 741 Q2
Area: Western Beringia
Topics: Review of faunal remains - Western Beringia, Faunal extinction, Faunal migration, Zoogeography, Climate history - Western Beringia, Vegetation history - Western Beringia, Insect macrofossils, Dating - radiocarbon, Faunal associations, Archaeological sites - Berelekh

1992 The Ecological Structure of the "Mammoth Fauna" in Eurasia. Annales Zoologici Fennici 28:253–259.

The so-called "Mammoth fauna" lived during the Late Pleistocene in northern Eurasia and in Alaska. About 30 indicator species inhabited a single hyperzone of "tundra-steppe" that existed where today there is recent steppe, taiga, and tundra. The ecological structure of the mammoth fauna was similar to that of recent communities of animals in African savannas. These ecological parallels of taxa inhabiting very different climatic zones may be analogized as a pyramid, one lateral half of which consists of beasts of the tundra-steppe, and the other half beasts of the savanna. The levels of the pyramid indicate biomass and feeding ecology. The lowest level of the pyramid is made up of grazers: Eurasian horses and kulan on the Pleistocene side, corresponding to zebra and African donkey on the Recent side; along with saiga and zeren, which correspond to African gazelles; bison, yak, and muskox, corresponding to African buffalo and eland. The next level consists of mixed feeders, consumers of grass, leaves, and woody sprouts, and includes Mammoth on the Pleistocene side, corresponding to African elephant; woolly rhinoceros, corresponding to white rhinoceros; roe deer and elk, corresponding to gerenuk and kudu. The third level contains carnivores: wolf and dhole on the Pleistocene side, corresponding to hunting dog and cheetah; and cave lion, corresponding to African lion. In the fourth level are scavengers: cave hyaena, polar fox and glutton, corresponding to spotted hyaena and jackal. Reindeer, lemming, and polar bear survived the disappearing Pleistocene tundra-steppe, and had no analogues in Africa.

Location: AEU SCI QL 1 A53
Area: Western Beringia
Topics: Beringian ecology, Megafauna, Faunal associations

Vereshchagin, N. K., and I. Y. Kuz'mina

1984 Late Pleistocene Mammal Fauna of Siberia. In *Late Quaternary Environments of the Soviet Union*, edited by A. A. Velichko, pp. 219-222. University of Minnesota Press, Minneapolis, Minnesota.

Comparison of species compositions of the mammal fauna of western and eastern Siberia and the south of the Far East showed that differences can be traced even for the Late Pleistocene. Remains of corsac fox, small cave bear, steppe ferret, gray marmot, Siberian mole-rat, and wide-hoofed horse were found only in western Siberia. Remains of tarbagan marmot, black-capped marmot, long-tailed ground squirrel, Indigirka arctic ground squirrel, Mongolian gazelle, and snow sheep were found only in eastern Siberia. There were many more species in the south of the Far East, namely, raccoon dog, Siberian weasel, yellow-throated marten, badger, otter, leopard cat, tiger, leopard, Manchurian hare, horse, wild boar, and mountain antelope.

Paleontologic data indicate a later Late Pleistocene settlement by mammals of northern regions of western Siberia, where cold-tolerant species predominated widely. The southern part was inhabited by warmth-loving species, associated either with forest biotopes or with steppe and semidesert biotopes. The Late Pleistocene mammal fauna of eastern Siberia was more uniform. In this complex one can distinguish only the faunas of the Transbaikal region and southeastern Siberia, including species of mountain and plains landscapes adapted to a dry, sharply continental climate. The composition of Far Eastern mammals in the Maritime Territory indicates a milder and more humid climate than in Siberia, and the penetration from the south of representatives of the Indo-Malayan zoogeographic region. All the latest studies confirm the hypothesis offered by Sushkin (1925) that there were different conditions of formation and development of western Paleoarctic, eastern Paleoarctic, and Far Eastern faunas.

Notes: Conclusions used as abstract. Contains extensive faunal lists. H. E. Wright Jr. and C. W. Barnosky (English-Language Edition eds.).
Location: AEU SCI QE 696 L347 E5
Area: Siberia, Western Beringia
Topics: Review of faunal remains - Western Beringia, Faunal migration, Zoogeography

Vereshchagin, N. K., and A. N. Tikhonov
1987 A Study of Mammoth Tusks from Permafrost of Northeastern Siberia. Current Research in the Pleistocene **4:120-122.**

Location: AEA PMA/ASA
Area: Siberia - northern, Western Beringia
Topics: Faunal remains - *Mammuthus*, Archaeological sites - Berelekh

PART 5. ARCHAEOLOGY AND HUMAN HISTORY

Abramova, Z. A.

1965 Krasnyi Iar - A New Palaeolithic Site on the Angara. Arctic Anthropology **3(1):122-128.**

Location: AEU PMC GN 1 A68
Area: Siberia - south-central, Western Beringia
Topics: Archaeological studies - Siberia, Archaeological sites - Siberia, Archaeological sites - Afontova Gora, Geoarchaeology, Lithics, Lithic affinities, Cultural traditions - Malta/Buryet, Faunal remains

1967 Palaeolithic Art in the U.S.S.R. Translated by C. Page and C. S. Chard. Arctic Anthropology **4(2):1-179.**

Location: AEU PMC GN 1 A68
Area: Siberia, Western Beringia
Topics: Archaeological sites - Siberia, Archaeological sites - Malta, Archaeological sites - Buryet, Archaeological sites - Afontova Gora, Bone modification

Ackerman, R. E.

1984 Prehistory of the Asian Eskimo Zone. In *Handbook of North American Indians, Volume 5, Arctic*, edited by D. Damas, pp. 106-118. Smithsonian Institution, Washington, D.C.

Notes: W. C. Sturtevant (series ed.).
Location: AEU HSS RF E 77 H23
Area: Siberia - northeastern, Western Beringia, Kamchatka
Topics: Lithics, Archaeological sites - Siberia, Archaeological sites - Lake Ushki, Archaeological sites - Diuktai Cave, Cultural traditions, Cultural traditions - Diuktai

Aikens, C. M.

1992 Hunting, Fishing, and Gathering in Pacific Northeast Asia: Pleistocene Continuities and Holocene Developments. In *Pacific Northeast Asia in Prehistory: Hunter-Fisher-Gatherers, Farmers, and Sociopolitical Elites*, edited by C. M. Aikens and Song Nai Rhee, pp. 99-104. Washington State University Press, Pullman, Washington.

This paper traces some basic environmental and technological factors that have structured the lives of Northeast Asians from terminal Pleistocene times onward. Its main thrust is to define the remarkable continuity of cultural tradition in the area, and the critical climatic and cultural changes that gave rise to the enthnohistorically known pattern of life there. The coasts and islands of Pacific Northeast Asia, and their immediate interiors, are central to the discussion, but data from the deeper interior are necessarily drawn on as well.

Notes: Papers presented at the Circum-Pacific Prehistory Conference, Seattle, August 1989. Abstract taken from introduction.
Location: AEU HSS GN 855 E27 P117
Area: Siberia, Western Beringia, Japan, Korea, Kamchatka
Topics: Lithics, Archaeological sites - Siberia, Archaeological sites - Lake Ushki, Archaeological sites - Diuktai Cave, Archaeological sites - Afontova Gora, Archaeological sites - Malta/Buryet, Faunal remains, Cultural traditions, Cultural traditions - Malta/Buryet, Archaeological sites - Japan, Archaeological sites - Japan - Hokkaido, Archaeological sites - China, Modern biogeography

Aksenov, M. P., and G. I. Medvedev

1968 New Data on the Pre-Neolithic Period of the Angara Region. Translated by R. Powers. Arctic Anthropology **5(1):213-223.**

Location: AEU PMC GN 1 A68
Area: Siberia - south-central, Western Beringia
Topics: Archaeological sites - Siberia, Archaeological sites - Malta/Buryet, Lithics, Faunal remains, Geoarchaeology

Bryan, A. L.

1980 Human Actions and Reactions - The Archaeological Record for East Asia and America. In *AMQUA, 6th Biennial Meeting, Orono, Maine, Abstracts and Program*, p. 51.

Location: AEU HSS QE 696 A5212
Area: Western Beringia, Eastern Beringia
Topics: Human migration, Hominid evolution

Chard, C. S.

1960 Routes to Bering Strait. American Antiquity 26:283-285.

Maximum glaciation in eastern Siberia, the final glaciation, the mountainous area, and the land area exposed by moderate lowerings of sea level are plotted on a map to illustrate that two routes from northeast Asia to northwest North America were available for human movements. The southern route along the coastal shelf may have played a more significant role in the initial settlement of the New World than did the northern route along the Arctic shore.

Location: AEU PMC CC 1 A6
Area: Siberia - eastern, Western Beringia
Topics: Human migration, Glacial history - Western Beringia

1974 *Northeast Asia in Prehistory*. University of Wisconsin Press, Madison, Wisconsin. xvi + 214 pp.

Notes: See especially Chapter 1: "Northeast Asia in the Pleistocene" (pp. 3-55).
Location: AEU HSS GN 855 E27 C47
Area: Siberia, Western Beringia, Mongolia, Korea, Japan, Japan - Hokkaido, China - northern, Kamchatka
Topics: Archaeological sites - Siberia, Archaeological sites - China, Archaeological sites - Mongolia, Archaeological sites - Japan, Archaeological sites - Korea, Archaeological sites - Afontova Gora, Archaeological sites - Lake Ushki, Archaeological sites - Malta/Buryet, Archaeological sites - Diuktai Cave, Archaeological sites - Anangula, Archaeological sites - Zhoukoudian, Lithics, Lithic affinities, Cultural traditions, Cultural traditions - Malta/Buryet, Vegetation history, Glacial history, Climate history, Sea level changes, Faunal migration, Faunal remains, Faunal remains - *Mammonteus trogontherii*, Human migration, Review of archaeology - Western Beringia, Review of archaeology - China

Chard, C. S., and W. B. Workman

1965 Soviet Archaeological Radiocarbon Dates: II. Arctic Anthropology 3(1):146-150.

Location: AEU PMC GN 1 A68
Area: Siberia, Western Beringia, Kamchatka
Topics: Dating - radiocarbon, Archaeological sites - Siberia, Archaeological sites - Afontova Gora, Archaeological sites - Lake Ushki

Clark, G. A.

1988 The Upper Paleolithic of Northeast Asia and its Relevance to the First Americans: A Personal View. Current Research in the Pleistocene 5:3-7.

Location: AEA PMA/ASA

Area: Siberia, Western Beringia, Eastern Beringia
Topics: Cultural traditions - Diuktai, Archaeological sites - Siberia, Archaeological sites - Diuktai Cave, Human migration, Lithics, Geoarchaeology

Derevianko, A. P.

1965 New Data on the Archaeology of the Middle Amur. Translated by G. H. Clark. Arctic Anthropology 3(1):136-141.

Location: AEU PMC GN 1 A68
Area: Siberia - southeastern, Western Beringia
Topics: Archaeological studies - Siberia, Archaeological sites - Siberia - southeastern, Lithics, Lithic affinities

1978 On the Migrations of Ancient Man from Asia to America in the Pleistocene Epoch. In *Early Man in America from a Circum-Pacific Perspective*, edited by A. L. Bryan, pp. 70-71. Occasional Papers No 1 of the Department of Anthropology, University of Alberta. Archaeological Researches International, Edmonton, Alberta.

Location: AEU HSS GN 17 E12
Area: Western Beringia, Kamchatka
Topics: Human migration, Cultural traditions, Archaeological sites - Siberia, Archaeological sites - Lake Ushki, Archaeological sites - Anangula, Lithics, Lithic affinities

1989 The Late Pleistocene Sites in the Selemdga River Basin and their Significance for Correlation with Upper Paleolithic Assemblages of the Pacific Basin. Translated by I. Laricheva. In *Circum-Pacific Prehistory Conference, Seattle, Washington, August 1-6 1989, Reprint Proceedings*. 24 pp., preceded by the abstract. Session II. Human Occupation of the Pacific Continents/Islands. A. Routes into the New World. Theme: Cultural Development in the Context of Circum-Pacific Cultural Interaction Sphere. Session organizer: R. E. Ackerman.

In the south of the Soviet Far East, rather few well stratified Paleolithic sites are known. As two of the earliest and best studied examples, we need to recognize a multilayered site near the Osinovka Village and the Geographical Society Cave in the Maritime Regions. Many features of the lower horizon of Osinovka make it appear older than the Upper Paleolithic. The third layer of the Geographical Society Cave is dated on bone to 32,570±1510 years. The stone tools recovered here are related to the underlying, fourth horizon, which ought to be assigned to the very beginning of the Upper Paleolithic. Also sites of the final Upper Paleolithic stage were investigated in the Maritime Regions near the Village Ustinovka, and are considered here.

Over a dozen localities of the Late Paleolithic were discovered in 1982-1984 by the author in the basin of the Selemdga River, the largest tributary of Zeya, which enters the Zeya 280 km from its mouth in latitude 51.6 degrees North. Taking into account that the Zeya is a tributary of the Amur River, sites discovered on the Selemdga must be generally assigned to the Amur Basin. In their geomorphology and stratigraphy they are similar to each other in the main indices. They lie on the second, third, and fourth terraces. All of the latter are the sode [sic] ones covering deposits of the same type. Unconsolidated material began to accumulate on the socle [sic] of the terraces more intensively during the second half of the Late Pleistocene. The sites were excavated from 1982-1988 including the exposed area about 5000 m^2. On the second, third and fourth terraces the following stratigraphy is traced: turf, grayish sandy loam (thin layers of alevrites - the result of long deflation); dark-brown loam of 30-60 cm thickness; light-brown loam with inclusion of roughly broken debris (20-40 cm), brown loam (10-30 cm) rock. The last two unconsolidated horizons are traced mainly on the third and fourth terraces. All horizons of the sites yielded artifacts. The latter are most numerous in the third layer. Here, two horizons of human habitation were revealed. Four sites lacked brown and light-brown loam. One locality yielded finds only in the grey sandy loam. On the whole, the stone industry of the sites represent one and the same techno-complex.

In the primary flaking of the lower horizon two types of cores are prevalent. The first one has its striking-platform on one end of the pebble and the front adjoining to it at an acute angle. In spite of the fact that the pebbles retain considerable areas of their crust, from such cores large knife-blades were derived. The other type of cores were the wedge

shaped types. From the lower (brown loam) to the upper (grey sandy loam) horizon, the number of pebble cores is diminishing but that of the wedge-shaped types are increasing. In the upper cultural horizon, cylindrical nuclei with microblade removal-scars appear all over their perimeter. Cores of the horoko and ubetsu types appear in the third horizon. All cultural layers yielded bifaces. The toolkit is represented by burins (corner, lateral. [sic] medial, single and multi-faceted), scrapers, knives, large scrapers (skrebloes), and combined tools. In the upper horizon, scaled pieces-skreblolike instruments of the Gromatukha type appear.

An important problem is dating the multi-layered sites of Selemdga. The third horizon of dark-brown loam is dated on coal by 19,360±60 years. Two underlying horizons may be dated by the time before 25,000 years and the layer of grey sandy loam is no older than 12,000 years. ...

Notes: Abstract abbreviated slightly.
Area: Siberia - southeastern, Western Beringia
Topics: Archaeological sites - Osinovka, Archaeological sites - Selemdga, Archaeological sites - Siberia - southeastern, Lithics, Stratigraphy, Review of archaeology - Siberia, Human migration

Dikov, N. N.

1965 The Stone Age of Kamchatka and the Chukchi Peninsula in the Light of New Archaeological Data. Translated by G. H. Clark. Arctic Anthropology 3(1):10-25.

Location: AEU PMC GN 1 A68
Area: Siberia - northeastern, Western Beringia, Kamchatka
Topics: Archaeological sites - Lake Ushki, Lithics, Lithic affinities, Tephra, Geoarchaeology, Archaeological sites - Siberia - northeastern, Faunal remains

1968 The Discovery of the Palaeolithic in Kamchatka and the Problem of the Initial Occupation of America. Translated by R. Powers. Arctic Anthropology 5(1):191-203.

Location: AEU PMC GN 1 A68
Area: Siberia - northeastern, Western Beringia, Kamchatka
Topics: Archaeological studies - Siberia, Archaeological sites - Lake Ushki, Lithics, Lithic affinities, Geoarchaeology, Human migration

1970 Paleolithic Culture of Kamchatka. In *Proceedings VIIIth International Congress of Anthropological and Ethnological Sciences, Tokyo and Kyoto, 1968. Volume III. Ethnology and Archaeology.* Symposium S-11 Prehistoric Cultural Relationships in Northern Eurasia and Northern North America, pp. 350-352. Science Council of Japan, Tokyo, Japan.

Location: AEU SCI GN 3 I59
Area: Western Beringia, Kamchatka
Topics: Pollen records, Stratigraphy, Human/hominid remains, Lithics, Lithic affinities, Archaeological sites - Lake Ushki, Human migration, Sea level changes

1978 Ancestors of Paleo-Indians and Proto-Eskimo-Aleuts in the Paleolithic of Kamchatka. In *Early Man in America from a Circum-Pacific Perspective*, edited by A. L. Bryan, pp. 68-69. Occasional Papers No 1 of the Department of Anthropology, University of Alberta. Archaeological Researches International, Edmonton, Alberta.

Location: AEU HSS GN 17 E12
Area: Siberia - northeastern, Western Beringia, Kamchatka
Topics: Archaeological sites - Lake Ushki, Archaeological sites - Anangula, Lithics, Lithic affinities, Human migration

1983 The Stages and Routes of Human Occupation of the Beringian Land Bridge Based on Archaeological Data. In *Quaternary Coastlines and Marine Archaeology: Towards the Prehistory of Land Bridges and Continental Shelves*, edited by P. M. Masters and N. C. Flemming, pp. 347-364. Academic Press, New York, New York.

Four stages of the peopling of Beringia can be singled out with different degrees of precision. Two first ones are hypothetically of Ziryansk glaciation (70,000-50,000 years ago) and of the beginning of Sartansk glaciation (more than 27,000 years ago). The third one refers to Sartansk glaciation (15,000-13,000 years ago) and is connected with bifacial projectile stemmed points of Ushki I type (Layer VIII) and Ul'khum on Chukotka at the end of Sartansk glaciation. The fourth stage (at the end of Sartansk glaciation - 11,000-10,000 years ago) corresponds to artifact sites of the Beringian tradition, containing wedge-shaped cores and leaf-shaped bifacial points (Ushki I, Layer VI; Kurupka I on the Chukotski Peninsula; and others).

Location: AEU HSS GN 741 Q22
Area: Siberia - northeastern, Western Beringia, Kamchatka
Topics: Archaeological sites - Lake Ushki, Archaeological sites - Berelekh, Lithics, Lithic affinities, Bone modification, Human migration, Cultural traditions, Archaeological sites - Anangula, Archaeological sites - Groundhog Bay, Archaeological sites - Gallagher Flint Station, Archaeological sites - Healy Lake, Archaeological sites - Trail Creek, Archaeological sites - Siberia

1985 The Paleolithic of Northeastern Asia and its Relations with the Paleolithic of America. Inter-Nord 17:173-177.

The new archaeological data suggest that the first emigrants to America could be paleanthrops who should crossed over the Beringia during Ziryansk glaciation. In any case in the Beringia took place cultural ties between proto-Eskaleuts until the latest paleolithic when the wide Bering's strait divided this zone.

Location: AEU HSS HC 10 I625
Area: Siberia, Western Beringia, Alaska, Eastern Beringia, Kamchatka
Topics: Human migration, Archaeological sites - Western Beringia, Archaeological sites - Lake Ushki, Archaeological sites - Berelekh, Archaeological sites - Anangula, Archaeological sites - Diuktai Cave, Archaeological sites - Eastern Beringia, Lithics, Lithic affinities, Cultural traditions, Cultural traditions - Diuktai, Faunal remains

1989 The Paleolithic of Kamchatka and Chukotka Related to the Problem of the Peopling of America via Beringia. In *Circum-Pacific Prehistory Conference, Seattle, Washington, August 1-6 1989, Reprint Proceedings*. 43 pp., preceded by the abstract. Session II. Human Occupation of the Pacific Continents/Islands. A. Routes into the New World. Theme: Cultural Development in the Context of Circum-Pacific Cultural Interaction Sphere. Session organizer: R. E. Ackerman.

The author has identified at least two ethnically different Late Paleolithic cultures in Kamchatka: the Early Ushki culture (14,000-13,000 B.P.) containing bifacial stemmed points similar to the Paleo-Indian ones found in the State of Washington and the Late Ushki proto-Eskimo-Aleut culture (11,000-10,000 B.P.) containing leaf shaped bifaces and wedge shaped cores. The transitional monuments on the route of dispersal of the Late Ushki culture to Alaska are Late Paleolithic sites Ul'khum, Kurupka, Chaatamye, Kymynanonvyvaam VII, XIV, etc., found on the Chukchi Peninsula by the author. The Stone Age workshop in the Puturak Pass on the Chukchi Peninsula opposite the St. Lawrence Island discovered by the author in 1985 is very similar to the Galagher [sic] Flint Complex in its blade technology.

Non-stratified sites of Kymynanonvyvaam IX, XII, XIII containing flint handaxe-like tools appear to be the earliest ones on the Chukchi Peninsula.

Area: Western Beringia, Siberia - eastern, Siberia - northeastern, Kamchatka
Topics: Archaeological sites - Lake Ushki, Lithics, Faunal remains - fish, Faunal remains, Cultural traditions, Faunal remains - *Canis*, Review of archaeology - Siberia, Cultural traditions - Diuktai, Burials

Dolitsky, A. B.

1985 Siberian Paleolithic Archaeology: Approaches and Analytic Methods. Current Anthropology 26:361-378.

According to Mochanov, the Upper Paleolithic sites of North Asia belong to two different cultural traditions: the Mal'ta-Afontova, characterized by stone tools worked by edge retouch (unifaces), and the Dyuktay, characterized by bifacially worked stone knives and spear points (bifaces). In sum, Mochanov's classification is based on the presence or absence of bifacially and unifacially manufactured artifacts. Abramova, in contrast, employing more sophisticated techno-typological methods of analysis, distinguishes two archaeological traditions, Kokorevo and Afontova, and points to a South Siberian archaeological tradition present in the Altay, Western Cis-Baykal, and Upper Yenisey regions. It is obvious that Soviet archaeologists specializing in Siberian history and archaeology are still limited to the traditional comparative techno-typological, environmental, and economic approaches for the analysis of archaeological data and the explanation of cultural change. The quantitative ecological approach has not yet been applied to the Soviet Subarctic and Arctic. The traditional approach of Siberian archaeologists lacks both comparative analyses and correlations of the archaeological assemblages of different geographical regions.

On the positive side, Soviet Paleolithic archaeologists have a great deal of experience with excavations of multicomponent, deeply stratified archaeological sites, especially houses, by the use of extended horizontal excavation units instead of the broad contiguous excavation units often employed in the American Arctic. This method of excavation allows the control of the horizontal distribution of cultural remains in a site and might help archaeologists to understand the range of human activities that occurred there within a certain chronological period. Siberian Paleolithic archaeologists very seldom focus, however, on spatial analyses of past human activities, probably because their traditional research concern is the progressive evolution of prehistoric productions. Although Soviet archaeologists can be considered pioneers of experimental use-wear, taphonomic and ecological explanatory-predictive methods for the reconstruction of prehistoric productive activities, Siberian Paleolithic archaeologist do not usually employ these methods in the field. A question we might ask of our Soviet colleagues is why.

Notes: Abstract taken from conclusion. A comprehensive review of the Siberian palaeolithic.
Location: AEU PMC GN 1 C97
Area: Siberia, Western Beringia, Kamchatka
Topics: Archaeological studies - Siberia, Archaeological sites - Siberia, Archaeological sites - Lake Ushki, Archaeological sites - Diuktai Cave, Archaeological sites - Osinovka, Archaeological sites - Malta/Buryet, Archaeological sites - Afontova Gora, Palaeontological sites - Old Crow, Cultural traditions - Diuktai, Cultural traditions, Cultural traditions - Malta/Afontova, Cultural traditions - Kokorevo, Lithics, Lithic affinities, Human migration, Glacial history - Siberia

Flenniken, J. J.

1987 The Paleolithic Dyuktai Pressure Blade Technique of Siberia. Arctic Anthropology 24(2):117-132.

This study documents the Dyuktai pressure blade technique through replicative systems analysis guided by the prehistoric artifacts from eight Siberian sites. The reduction technology that persisted in Siberia for 25,000 years is presented in terms of stages in which the blades were produced. Prehistoric and replicated artifacts from the various stages are illustrated to support the concept that the Dyuktai pressure blade technique was a culturally determined reduction system.

Location: AEU PMC GN 1 A68
Area: Siberia, Western Beringia
Topics: Archaeological sites - Siberia, Archaeological sites - Diuktai Cave, Cultural traditions - Diuktai, Lithics, Tool technology - modern

Goebel, T., A. P. Derevianko, and V. T. Petrin

1993 Dating the Middle-to-Upper-Paleolithic Transition at Kara-Bom. Current Anthropology 34:452-458.

Location: AEU PMC GN 1 C97
Area: Siberia - southwestern, Western Beringia

Topics: Dating, Archaeological sites - Siberia - southwestern, Geoarchaeology, Palaeosols, Lithics, Lithic affinities, Faunal remains - *Equus*, Faunal remains - *Coelodonta antiquitatis*, Faunal remains - *Bison*, Faunal remains - *Bos grunniens*, Faunal remains - *Spirocerus kiakhtensis*, Faunal remains - *Ovis ammon*, Faunal remains - *Crocuta spelaea*, Faunal remains - *Canis lupus*, Faunal remains - *Marmota*, Faunal remains - *Lepus*, Periglacial features

Ikawa-Smith, F.

1982 The Early Prehistory of the Americas as Seen from Northeast Asia. In *Peopling of the New World*, edited by J. E. Ericson, R. E. Taylor and R. Berger, pp. 15-33. Ballena Press Anthropological Papers No. 23. Ballena Press, Los Altos, California.

Notes: L. J. Bean and T. C. Blackburn (series eds.).
Location: AEU HSS E 61 P42
Area: Western Beringia, Japan, China - northern, Siberia, Korea
Topics: Human migration, Lithics, Lithic affinities, Archaeological sites - Japan, Archaeological sites - Japan - Hokkaido, Archaeological sites - China - northern, Archaeological sites - Shiyu, Archaeological sites - Zhoukoudian, Archaeological sites - Korea, Archaeological sites - Siberia, Archaeological sites - Diuktai Cave, Archaeological sites - Afontova Gora, Archaeological sites - Osinovka, Archaeological sites - Malta, Cultural traditions - Malta/Afontova, Cultural traditions - Diuktai, Faunal remains, Faunal remains - *Bos*, Faunal remains - *Bison*, Plant macrofossils - peat

Khlobystin, L. P.

1969 The Stratified Settlement of Ulan-Khada on Lake Baikal (Based on Materials Excavated by B. E. Petri). Translated by G. Clark. Arctic Anthropology 6(1):88-94.

Location: AEU PMC GN 1 A68
Area: Siberia - south-central, Western Beringia
Topics: Archaeological sites - Siberia, Geoarchaeology, Lithics

Klein, R. G.

1967 Radiocarbon Dates on Occupation Sites of Pleistocene Age in the U.S.S.R. Arctic Anthropology 4(2):224-226.

Location: AEU PMC GN 1 A68
Area: Western Beringia, Kamchatka
Topics: Dating - radiocarbon, Archaeological sites - Siberia, Archaeological sites - Afontova Gora, Archaeological sites - Kokorevo, Archaeological sites - Malta, Archaeological sites - Lake Ushki, Plant macrofossils

1971 The Pleistocene Prehistory of Siberia. Quaternary Research 1:133-161.

Very little is known about the prehistory of Siberia prior to the Sartan ("Main Würm" = "Main Wisconsin") Stadial of the Last Glacial. It is not yet clear whether this is a result of the inadequacy of investigations so far or of the fact that human occupation was relatively limited in pre-Sartan times. The Sartan occupation of Siberia has been well documented by the discovery of a relatively large number of open-air sites in the major river valleys of the region. The large numbers of broken-up animal bones found at many of these sites, in combination with rich inventories of bone and stone artifacts and remains of structures, hearths, etc., show that the Sartan inhabitants of Siberia were comparable in level of cultural development to their European (Upper Paleolithic) contemporaries. More particularly, they seem to have been effective big-game hunters, fully capable of exploiting the comparatively rich game resources of their open country environment. As in Europe, evidence from Siberia suggests that the environmental change (especially reforestation) which took place at the end of the Last Glacial led to decreased reliance on big-game hunting and increased emphasis on other modes of subsistence, especially fishing.

Notes: Review of Siberian palaeolithic sites. Contains extensive faunal lists.
Location: AEU SCI QE 696 Q24
Area: Siberia, Western Beringia, Kamchatka
Topics: Modern biogeography, Geoarchaeology, Archaeological sites - Afontova Gora, Archaeological sites - Kokorevo, Archaeological sites - Buryet, Archaeological sites - Malta, Archaeological sites - Berelekh, Archaeological sites - Diuktai Cave, Archaeological sites - Osinovka, Archaeological sites - Lake Ushki, Archaeological sites - Western Beringia, Glacial history - Siberia, Climate history - Siberia, Vegetation history - Siberia, Pollen records - Siberia, Sea level changes, Faunal remains - Siberia, Lithics

1976 Cultural Adaptations to Pleistocene "Steppe Tundras" in the Old World. In *AMQUA, 4th Biennial Meeting, Tempe, Arizona, Abstracts*, pp. 90-91.

Area: Western Beringia
Topics: Hominid evolution, Human migration

Kuzmin, Y. V.

1991 Palaeoenvironment of the Ancient Cultures of the USSR Far East in Late Pleistocene and Holocene. In *INQUA, 13th International Congress, Beijing, China, Abstracts*, p. 181.

Area: Siberia - eastern, Western Beringia, Kamchatka
Topics: Archaeological sites - Siberia, Archaeological sites - Lake Ushki, Climate history - Western Beringia

Larichev, V., U. Khol'ushkin, and I. Laricheva

1987 Lower and Middle Paleolithic of Northern Asia: Achievements, Problems, and Perspectives. Translated by I. Laricheva. Journal of World Prehistory 1(4):415-464.

Considerable progress has been made in recent years in the study of the Lower and Middle Paleolithic of northern Asia. There is growing evidence for initial human occupation before 700,000 years ago-as early as elsewhere in Asia-and for a very early adaptation to the arctic desert environment. New models of Lower Paleolithic settlement involve expansion and reduction of occupation in response to climatic variation, rather than simple colonization followed by steady occupation. The Middle Paleolithic of northern Asia is better documented, including actual finds of archaic *Homo sapiens*. The transition to the Upper Paleolithic seems to involve the survival of earlier cultural traits, but the mechanisms and processes are not well understood. Further significant knowledge concerning these periods awaits the development of common methodologies for classification and analysis.

Location: AEU PMC GN 700 J88
Area: Siberia, Western Beringia
Topics: Archaeological studies - Siberia, Archaeological sites - Siberia, Archaeological sites - Malta/Buryet, Archaeological sites - Afontova Gora, Lithics, Lithic affinities, Geoarchaeology, Pollen records, Faunal remains - *Crocuta spelaea*, Faunal remains - *Rhinoceros tichorhinus*, Faunal remains - *Spirocerus kiakhtensis*, Faunal remains - *Canis lupus*, Faunal remains - *Vulpes vulpes*, Faunal remains - *Ursus arctos*, Faunal remains - *Meles meles*, Faunal remains - *Mustela erminea*, Faunal remains - *Ovis ammon*, Faunal remains - *Poëphagus grunniens*, Faunal remains - *Equus caballus*, Faunal remains - *Equus hemionus*, Faunal remains - *Gazella subgutturosa*, Faunal remains - *Coelodonta antiquitatis*, Faunal remains - *Mammonteus primigenius*, Faunal remains - *Bison priscus*, Faunal remains - *Alces alces*, Faunal remains - *Saiga tatarica*, Faunal remains - *Cervus elaphus*, Faunal remains - *Panthera*, Faunal remains - *Gulo*, Faunal remains - *Ursus*

1988 The Upper Paleolithic of Northern Asia: Achievements, Problems, and Perspectives. I. Western Siberia. Translated by I. Laricheva. Journal of World Prehistory 2(4):359-396.

The beginning of the Upper Paleolithic in Western Siberia is now dated to almost 35,000 B.P. The earliest sites reveal a well-developed blade technology and very sophisticated mobiliary art. The evidence suggests that the early Upper Paleolithic developed within Siberia out of the local Mousterian and that there is no need to regard it as an intrusive phenomenon out of the west, as has been traditionally done. The florescence of the Western Siberian Upper Paleolithic began at about the glacial maximum and two major cultural groups can be identified. However, they share many features in common and seem not to have existed in isolation from each other; instead, it is possible to trace numerous complex and interwoven connections between them. Together, they form a Western Siberian Upper Paleolithic technocomplex, which was essentially local but fully as sophisticated and as technologically advanced as was that of Europe.

Location: AEU PMC GN 700 J88
Area: Siberia - southwestern, Western Beringia
Topics: Archaeological sites - Siberia - western, Archaeological sites - Afontova Gora, Lithics, Lithic affinities, Cultural traditions - Diuktai, Cultural traditions - Malta/Buryet, Cultural traditions - Afontova-Kokorevo, Archaeological studies - Siberia, Geoarchaeology, Faunal remains - *Elephas primigenius*, Faunal remains - *Coelodonta antiquitatis*, Faunal remains - *Equus caballus*, Faunal remains - *Rangifer tarandus*, Faunal remains - *Cervus elaphus*, Faunal remains - *Bison priscus*, Faunal remains - *Ovis ammon*, Faunal remains - *Capra sibirica*, Faunal remains - *Saiga tatarica*, Faunal remains - *Vulpes vulpes*, Faunal remains - *Marmota*, Faunal remains - *Lepus*, Faunal remains - *Alopex lagopus*, Faunal remains - *Citellus*, Faunal remains - *Lagopus lagopus*, Faunal remains - *Mammuthus primigenius*, Faunal remains - *Equus hemionus*, Climate history - Siberia, Pollen records - Siberia

1990 The Upper Paleolithic of Northern Asia: Achievements, Problems, and Perspectives. II. Central and Eastern Siberia. Translated by I. Laricheva. Journal of World Prehistory 4(3):347-385.

Earlier scholars believed that the Upper Paleolithic of Central and Eastern Siberia appeared very late. However, modern research has shown that not only was there a local Middle Paleolithic, but also there was a very early series of sites in Central Siberia which show both Middle and early Upper Paleolithic traits. These are called the Makarovo horizon and may be 70,000-50,000 years old; features derived from this horizon can be dated to about 30,000 B.P. and can be seen in the early D'uktai culture. The true early Upper Paleolithic is relatively homogeneous in Central and Eastern Siberia and includes artwork. The local Upper Paleolithic reached its florescence in the culture of Mal'ta and Bur'et', which developed out of local antecedents and which is here reinterpreted in light of recent research (including the artwork, structures, and burials). The final stages of the Upper Paleolithic show considerable variability, perhaps including some exotic traits.

Location: AEU PMC GN 700 J88
Area: Siberia - south-central, Western Beringia
Topics: Cultural traditions - Malta/Buryet, Cultural traditions - Diuktai, Archaeological studies - Siberia, Geoarchaeology, Loess, Lithics, Lithic affinities, Archaeological sites - Siberia - south-central, Archaeological sites - Malta/Buryet, Pollen records - Siberia, Faunal remains - Siberia

1992 The Upper Paleolithic of Northern Asia: Achievements, Problems, and Perspectives. III. Northeastern Siberia and the Russian Far East. Translated by I. Laricheva. Journal of World Prehistory 6(4):441-476.

Research into the Upper Paleolithic of northeastern Asia began in the 1940s. Recent work has led to the discovery of numbers of sites, some of them more than 30,000 years old, which are assigned to the D'uktai culture. The material recovered from these sites indicates relationships between the D'uktai culture and other cultures in Europe, Japan, Korea, China, and North America. For the most part, however, these similarities do not result from a spread of cultural traits from Europe into Asia. Instead, most of them reflect local development of the Upper Paleolithic, within both Asia and Europe, out of local Middle Paleolithic industries, which were themselves originally similar in technology and typology.

Location: AEU PMC GN 700 J88
Area: Siberia - eastern, Siberia - northeastern, Western Beringia, Kamchatka

Topics: Archaeological studies - Siberia, Archaeological sites - Siberia, Archaeological sites - Osinovka, Archaeological sites - Diuktai Cave, Archaeological sites - Berelekh, Lithics, Lithic affinities, Geoarchaeology, Cultural traditions - Diuktai, Pollen records - Siberia, Archaeological sites - Lake Ushki

Maringer, J.

1963 Mongolia before the Mongols. Arctic Anthropology **1(2):75-85.**

Location: AEU PMC GN 1 A68
Area: Mongolia
Topics: Archaeological studies - Mongolia, Archaeological sites - Mongolia, Lithics, Lithic affinities

Michael, H. N.

1984 Absolute Chronologies of Late Pleistocene and Early Holocene Cultures of Northeastern Asia. Arctic Anthropology **21(2):1-68.**

Major Paleolithic sites in Soviet northeastern Asia are surveyed on a regional basis. The regions surveyed include (1) the Lena-Aldan valleys and associated territories, (2) Western Siberia and the Altay, (3) the middle Yenisey River valley, (4) the Angara Basin and the Cis-Baykal, (5) the Trans-Baykal, (6) the middle Amur, (7) the Primorye (Maritime) region, (8) Kamchatka, and (9) the upper Kolyma Basin. Particular attention is paid to those sites in the Lena and Aldan valleys which form the nucleus of the Dyuktay culture and to the recently discovered and radiocarbon-dated sites in Western Siberia (the upper Yenisey Basin) and in Eastern Siberia (the Baykal-Angara region and the Trans-Baykal). The radiocarbon dates are critically analyzed and compared. Stratified cryogenic phenomena, which are present in many of the Siberian sites, are described and their role in refining geological dating is illustrated and discussed.

Notes: A detailed review of Siberian archaeological sites.
Location: AEU PMC GN 1 A68
Area: Siberia, Western Beringia, Kamchatka
Topics: Archaeological studies - Siberia, Archaeological sites - Siberia, Archaeological sites - Diuktai Cave, Archaeological sites - Osinovka, Archaeological sites - Lake Ushki, Archaeological sites - Berelekh, Archaeological sites - Afontova Gora, Glacial history, Geoarchaeology, Lithics, Lithic affinities, Cultural traditions - Diuktai, Cultural traditions - Afontova, Palaeontological sites - Old Crow, Dating - radiocarbon, Plant macrofossils, Plant macrofossils - wood, Faunal remains, Faunal remains - *Mammuthus primigenius*, Faunal remains - *Bison priscus*, Faunal remains - *Equus caballus*, Faunal remains - *Rangifer tarandus*, Faunal remains - *Ovis nivicola*, Faunal remains - *Canis lupus*, Faunal remains - *Vulpes vulpes*, Faunal remains - *Alopex lagopus*, Faunal remains - *Lepus*, Faunal remains - *Citellus*, Faunal remains - birds, Faunal remains - fish, Review of archaeological sites - Siberia

Mochanov, I. A.

1978 Stratigraphy and Absolute Chronology of the Paleolithic of Northeast Asia, According to the Work of 1963-1973. In *Early Man in America from a Circum-Pacific Perspective*, edited by A. L. Bryan, pp. 54-66. Occasional Papers No 1 of the Department of Anthropology, University of Alberta. Archaeological Researches International, Edmonton, Alberta.

Location: AEU HSS GN 17 E12
Area: Siberia - northeastern, Kamchatka, Western Beringia
Topics: Archaeological sites - Siberia - eastern, Archaeological sites - Diuktai Cave, Archaeological sites - Berelekh, Archaeological sites - Lake Ushki, Geoarchaeology, Periglacial features - fossil ice wedges, Lithics, Lithic affinities, Cultural traditions - Diuktai, Vegetation history, Glacial history, Faunal remains - *Mammuthus primigenius*, Faunal remains - *Coelodonta antiquitatis*, Faunal remains - *Ovibos moschatus*, Faunal remains - *Equus caballus*, Faunal remains - *Rangifer tarandus*, Faunal remains - *Bison priscus*

1978 The Paleolithic of Northeast Asia and the Problem of the First Peopling of America. In *Early Man in America from a Circum-Pacific Perspective*, edited by A. L. Bryan, p. 67. Occasional Papers No 1 of the Department of Anthropology, University of Alberta. Archaeological Researches International, Edmonton, Alberta.

Location: AEU HSS GN 17 E12
Area: Siberia, Western Beringia
Topics: Archaeological sites - Siberia, Lithics, Cultural traditions - Malta/Afontova, Cultural traditions - Diuktai, Cultural traditions, Faunal associations, Human migration

Mochanov, Y. A.

1986 Paleolithic Finds in Siberia (Résumé of Studies). Translated by R. Chakravarty. In *Beringia in the Cenozoic Era*, edited by V. L. Kontrimavichus, pp. 694-724. Russian Translation Series No. 28. A. A. Balkema, Rotterdam, The Netherlands.

The author describes Paleolithic finds in Siberia. The technical and typological features of various stone implements show them to belong to the Malta-Afontov and Diuktai traditions. The former is chiefly characterized by stone artifacts with retouched edges. The latter is mainly typified by bifacial knives, spear-heads and darts.

About 35-22 thousand years ago various local Diuktai traditions were probably most widespread in Siberia. Artifacts of other traditions of that period are insufficiently studied. About 22-20 thousand years ago Northern Asia was apparently the site of two major cultural provinces, namely the "Western" (Malta-Afontov) and "Eastern" (Diuktai) traditions. The boundary line between the two provinces may tentatively be drawn along the watershed of the Lena and Yenisei basins. The differences betwen [sic] the two cultures can hardly be explained by the direct influence of environmental conditions, since the material for manufacturing different implements and the wild game in the two regions were virtually the same.

The cultures of the Diuktai tradition are apparently in genetic relationship with "bifacial" cultures represented by artifacts from the South Urals, Kazakhstan, Mongolia and Northeast China, the artifacts being related to the Kazantzev (Riss-Wurm) and earlier times. The Malta-Afontov traditions apparently originated from the Levallois-Moustier cultures of Middle and Central Asia.

The oldest invasions of the New World by Man may have taken place during migrations of certain Diuktai populations from North-East Asia via the Bering Land Bridge to Alaska and farther South. These migrations could have occurred episodically 33-11 thousand years ago. Some 10.5 thousand years ago Arctic America was probably the object of invasions by certain Malta-Afontov populations. This is evidenced by artifacts of the Sumnagin culture, which existed in North-East Asia about 10.5-6 thousand years ago.

Notes: Translation of *Beringiya v Kainozoe*. Vladivostok, 1976. Collection of papers presented at the All-Union Symposium "The Bering Land Bridge and its Role in the History of Holarctic Floras and Faunas in the Late Cenozoic" held at Khabarovsk in May, 1973.
Location: AEU POLAR 56:(*3) KON
Area: Siberia, Kamchatka, Western Beringia, Mongolia
Topics: Archaeological sites - Siberia, Archaeological sites - Malta, Archaeological sites - Buryet, Archaeological sites - Afontova Gora, Archaeological sites - Kokorevo, Archaeological sites - Diuktai Cave, Archaeological sites - Berelekh, Archaeological sites - Lake Ushki, Lithics, Lithic affinities, Cultural traditions, Cultural traditions - Diuktai, Cultural traditions - Malta/Afontova, Archaeological studies - Siberia, Faunal remains, Faunal remains - *Mammuthus primigenius*, Faunal remains - *Bison priscus*, Faunal remains - *Equus caballus*, Faunal remains - *Rangifer tarandus*, Faunal remains - *Ovibos moschatus*, Archaeological sites - Anangula, Archaeological sites - Gallagher Flint Station, Palaeontological sites - Old Crow, Geoarchaeology, Climate history, Human migration

Mochanov, Y. A., and S. A. Fedoseeva

1986 Main Periods in the Ancient History of North-East Asia. Translated by R. Chakravarty. In *Beringia in the Cenozoic Era*, edited by V. L. Kontrimavichus, pp. 669-693. Russian Translation Series No. 28. A. A. Balkema, Rotterdam, The Netherlands.

Research over the last decade has resulted in the discovery of a succession of archaeological cultures for the Upper Pleistocene and Holocene in North-East Asia. The periods of those cultures have been determined by numerous radiocarbon datings as follows:

1. Diuktai Paleolithic Culture: 35,000 to 10,800 yr. BP;
2. Sumnagin Paleolithic Culture: 10,800 to 6,200 yr. BP;
3. Syalakh Neolithic Culture: 6,200 to 5,000 yr. BP;
4. Belkachi Neolithic Culture: 5,000 to 3,900 yr. BP;
5. Ymyiakh-takh Neolithic Culture: 3,900 to 3,100 yr. BP;
6. Ust Mil Bronze Age Culture: 3,100 to 2,100 yr. BP;
7. Various Iron Age Complexes: 2,100 to 500 yr. BP;

All the cultures existed over a huge area, from the Stanovoy Range and the Angara River basin in the south to the Arctic Ocean in the north, and from Kheta and Upper Vilui in the west to the Sea of Okhotsk and the Anadyr River basin in the east. But each culture, though it may have had specific local versions, occupied, at least at the end of its development, the entire area where finds characteristic of that culture have been made.

Analysis of the material suggests that one culture was replaced by another mainly on account of migrations from the south. The migrants partially ousted the aborigines to less favorable regions and assimilated those who remained. As a result, a new culture developed. In the Pleistocene the people driven away from the south crossed the Bering Land Bridge from North-East Asia to Alaska, while in the Holocene they crossed the Bering Strait over the ice.

So far, three migrations to America have been noted, namely the Diuktai, Sumnagin and Belkachi migrations.

The Diuktai people were presumably ancestors of some northern Paleo-Indian populations; the Sumnagin people represented an ancestral branch of the Proto-Eskimo-Aleut population; and the Belkachi migrants were an ancestral branch of the Protoatapasks.

Notes: Translation of *Beringiya v Kainozoe*. Vladivostok, 1976. Collection of papers presented at the All-Union Symposium "The Bering Land Bridge and its Role in the History of Holarctic Floras and Faunas in the Late Cenozoic" held at Khabarovsk in May, 1973.

Location: AEU POLAR 56:(*3) KON

Area: Siberia, Western Beringia

Topics: Archaeological sites - Siberia, Archaeological sites - Diuktai Cave, Geoarchaeology, Lithics, Lithic affinities, Cultural traditions, Cultural traditions - Diuktai, Archaeological sites - Onion Portage, Archaeological sites - Tangle Lakes, Archaeological sites - Healy Lake, Archaeological sites - Dry Creek, Human migration

Müller-Beck, H.

1982 Late Pleistocene Man in Northern Alaska and the Mammoth-Steppe Biome. In *Paleoecology of Beringia*, edited by D. M. Hopkins, J. V. Matthews Jr., C. E. Schweger and S. B. Young, pp. 329-352. Academic Press, New York, New York.

The adaptation of man to the steppe-tundra was evidently a slow and time-consuming process. There is evidence of man actively hunting elephants during the middle Pleistocene, as early as 400,000 to 300,000 years ago, in the steppe and grassland areas of the Old World. Man gradually adapted to the cooler regions of the steppe-tundra that covered vast areas of Central Europe; we have evidence of man hunting *Mammuthus primigenius* in this environment as early as 80,000 to 60,000 years ago. We know that Neanderthal man lived and hunted in the warmer regions of far northern Eurasia. By 35,000 years ago man shared the more temperate areas of the mammoth's habitat from France to Siberia; and by 14,000 years ago man lived, at least seasonally, throughout the mammoth's Old World domain.

Mammoth was not the only prey of early man, who obtained perhaps one specimen per hunter per year. More often *Rangifer tarandus* and *Equus caballus* or *E. przewalski* were hunted, as well as *Bison*, *Bos*, *Saiga*, *Cervus*, and *Capreolus*. There is evidence at kill sites of many medium-sized animals, and some small, such as *Lepus* and *Alopex*. Birds, fish, and plants were also consumed.

Man was well adapted to the more meliorated areas of the steppe-tundra by 40,000 years ago and had the technical resources to cross the land bridge from the Old World to the New. It is also reasonable to assume that if man had crossed the land bridge during an earlier time he would have adapted to the steppe-tundra conditions in Beringia as he did in Northern Eurasia.

Location: AEU SCI QE 720 W47, AEA PMA/ASA 560.45 P174
Area: Western Beringia
Topics: Megafauna, Vegetation history - Western Beringia, Pollen records - Western Beringia, Beringian environment, Archaeological sites - Western Beringia, Archaeological sites - Zhoukoudian, Archaeological sites - Malta, Archaeological sites - Berelekh, Cultural traditions - Diuktai, Lithics, Faunal associations, Zoogeography - *Mammuthus*, Faunal remains - Western Beringia, Faunal remains - *Coelodonta antiquitatis*, Faunal remains - *Mammuthus primigenius*, Faunal remains - *Cervus elaphus*, Faunal remains - *Canis lupus*, Faunal remains - *Palaeoloxodon namadicus*, Faunal remains - *Gazella*, Faunal remains - *Equus hemionus*, Faunal remains - *Equus przewalskii*, Faunal remains - *Cervus*, Faunal remains - *Capreolus*, Faunal remains - *Sus*, Faunal remains - *Rangifer*, Faunal remains - *Alopex*, Faunal remains - *Equus lenensis*, Faunal remains - *Bison priscus*, Faunal remains - *Lepus tanaiticus*

Okladnikov, A. P.

1959 *Ancient Population of Siberia and its Cultures*. Translated by V. M. Maurin. Russian Translation Series of the Peabody Museum of Archaeology and Ethnology, Harvard University, Vol. 1, No. 1. The Peabody Museum, Cambridge, Massachusetts. vii + 96 pp.

Notes: See especially Chapter 1: "Original Settlement" (pp. 1-11).
Location: AEU HSS GN 855 S5 O4
Area: Siberia, Western Beringia
Topics: Human/hominid remains, Human migration, Archaeological sites - Siberia, Archaeological sites - Afontova Gora, Archaeological sites - Malta/Buryet, Lithics, Faunal remains, Faunal associations

1961 The Paleolithic of Trans-Baikal. American Antiquity 26:486-497.

Paleolithic remains, mostly surface finds from blowouts, are known from 63 sites in the Trans-Baikal, one of the five large regional subdivisions of the Siberian Paleolithic. Most important recent discoveries are the stratified sites of Oshurkovo and Sannyi Mys and the Pleistocene faunal sequence on Tologoi Mountain. Characteristic stone tools are made from whole or split pebbles and from blades removed from prismatic cores. Bone artifacts, known from Oshurkovo, include slotted points and knives and flat antler harpoons. The Trans-Baikal finds, all Upper Paleolithic in time, are tentatively arranged in five chronological stages. The earliest period is based on the lower levels at Sannyi Mys in which microblades, but no pebble tools, are found with woolly rhinoceros and mammoth. The next period is represented by large pebble tools and cores from Ust'-Kiakhta Locality 3. Typical Siberian pebble tools found with horse in the upper levels at Sannyi Mys are assigned to the third stage. The fourth is best known from Oshurkovo where all the common Siberian Paleolithic stone tools are found along with bone artifacts in deposits which contain abundant fish bones. A number of sites are assigned to the fifth stage, but it is best represented by the uppermost level at Oshurkovo where flakes, flaked pebbles, and small blade tools of regular outline replace the large blades and pebble cores of the earlier periods. This tentative sequence is strengthened by correlations with the Angara and Yenisei areas to the west and with Mongolia and North China to the east. The Trans-Baikal is seen as an area in which the prismatic core and blade tradition of Eurafrican origin and the split pebble-tool tradition of eastern Asia were in contact from the earliest known period.

Location: AEU PMC CC 1 A6
Area: Siberia - south-central, Western Beringia, Mongolia
Topics: Archaeological sites - Siberia - south-central, Archaeological sites - Malta/Buryet, Archaeological sites - Afontova Gora, Lithics, Lithic affinities, Bone modification, Faunal remains - *Spirocerus*, Faunal remains - *Cervus elaphus*, Faunal remains - *Elephas namadicus*, Faunal remains - *Mammuthus*, Faunal remains - *Coelodonta antiquitatis*, Faunal remains - *Bison*, Faunal remains - *Hyaena crocuta*, Faunal remains - *Hyaena ultima*, Faunal remains - *Alces*

1965 Palaeolithic Finds in the Region of Lake Orok-Nor. Translated by W. B. Workman. Arctic Anthropology 3(1):142-145.

Location: AEU PMC GN 1 A68

Area: Mongolia
Topics: Archaeological sites - Mongolia, Lithics, Lithic affinities

1965 Chapter 2: The First Traces of Man. In *The Soviet Far East in Antiquity: An Archaeological and Historical Study of the Maritime Region of the U.S.S.R.* Translated by Dr. and Mrs. S. P. Dunn, and Dr. P. Tolstoy, edited by H. N. Michael, pp. 24-42. Arctic Institute of North America, Anthropology of the North: Translations from Russian Sources, No. 6. University of Toronto Press, Toronto, Ontario.

Location: AEU HSS DK 771 D3 A72
Area: Siberia, Western Beringia, Mongolia
Topics: Archaeological sites - Siberia, Archaeological sites - Osinovka, Lithics, Lithic affinities, Geoarchaeology, Archaeological sites - Japan, Archaeological sites - China, Archaeological sites - Zhoukoudian, Archaeological sites - Mongolia

1972 Découverte du Paléolithique Inférieur en Sibérie et en Mongolie. Inter-Nord 12:191-206.

Location: AEU HSS HC 10 I625
Area: Siberia, Western Beringia, Mongolia
Topics: Archaeological sites - Mongolia, Archaeological sites - Siberia, Lithics, Lithic affinities
Language: French with English summary pp. 204-206.

Okladnikov, A. P., and G. A. Pospelova
1982 Ulalinka, the Oldest Palaeolithic Site in Siberia. Current Anthropology 23:710-712.

Location: AEU PMC GN 1 C97
Area: Siberia, Western Beringia
Topics: Archaeological sites - Siberia, Geoarchaeology, Lithics, Lithic affinities, Palaeomagnetism

Powers, W. R.
1973 Palaeolithic Man in Northeast Asia. Arctic Anthropology 10(2):1-106.

Notes: A comprehensive review of the Siberian palaeolithic.
Location: AEU PMC GN 1 A68
Area: Siberia, Western Beringia, China - northeastern, Kamchatka
Topics: Archaeological studies - Siberia, Archaeological sites - Siberia, Archaeological sites - Osinovka, Archaeological sites - Diuktai Cave, Archaeological sites - Lake Ushki, Archaeological sites - Berelekh, Cultural traditions - Diuktai, Lithics, Lithic affinities, Geoarchaeology, Vegetation history, Pollen records, Climate history, Glacial history, Zoogeography, Faunal remains - *Mammuthus primigenius*, Faunal remains - *Coelodonta antiquitatis*, Faunal remains - *Bison priscus*, Faunal remains - *Ovibos moschatus*, Faunal remains - *Equus przewalskii*, Faunal remains - *Equus caballus*, Faunal remains - *Bos primigenius*, Faunal remains - *Rangifer tarandus*, Faunal remains - *Cervus elaphus*, Faunal remains - *Alces alces*, Faunal remains - *Ovis nivicola*, Faunal remains - *Canis lupus*, Faunal remains - *Alopex lagopus*, Faunal remains - *Ochotona pusilla*, Faunal remains - *Citellus undulatus*, Faunal remains - *Lemmus sibiricus*, Faunal remains - *Dicrostonyx torquatus*, Faunal remains - *Ursus arctos*, Faunal remains - *Moschus moschiferus*, Faunal remains - *Nemorhaedus goral*, Faunal remains - birds, Faunal remains - fish, Review of archaeology - Siberia

Praslov, N. D.
1984 Paleolithic Cultures of the Late Pleistocene. In *Late Quaternary Environments of the Soviet Union*, edited by A. A. Velichko, pp. 313-318. University of Minnesota Press, Minneapolis, Minnesota.

Notes: H. E. Wright Jr. and C. W. Barnosky (English-Language Edition eds.).
Location: AEU SCI QE 696 L347 E5
Area: Western Beringia
Topics: Archaeological sites - Siberia, Archaeological sites - Berelekh, Archaeological sites - Malta/Buryet, Archaeological sites - Diuktai Cave, Faunal remains, Lithics, Plant macrofossils - wood, Human migration

Ravskii, E. I., and S. M. Tseitlin
1968 Geological Periodization of the Sites of the Siberian Palaeolithic. Arctic Anthropology 5(1):76-81.

The geological sequence of the Palaeolithic sites of the Angara group set forth by the present authors is very similar to that adopted by N. A. Logachev. However, in his work the chronological groups of Palaeolithic sites are not compared with the main geological events of the Pleistocene, as a result of which the Palaeolithic cultures do not have a clear stratigraphic tie-in.

Thus, a detailed study of the geology of the Siberian Palaeolithic shows that all the known Palaeolithic sites are confined to a stratigraphic interval from the end of the Zyrianka glaciation to the beginning of the Holocene.

The materials adduced on the geology of the Siberian Palaeolithic also enable one to draw a more precise picture of the geological events of the last glaciations of Siberia, and in particular to establish a more complex history of the Sartan glaciation, fixed by the presence in its deposits of at least one buried soil, which indicates the existence within it of an interstadial interval.

Notes: Abstract taken from conclusions.
Location: AEU PMC GN 1 A68
Area: Siberia, Western Beringia
Topics: Archaeological sites - Siberia, Geoarchaeology, Loess, Archaeological sites - Afontova Gora, Archaeological sites - Malta/Buryet, Archaeological sites - Kokorevo

Rogers, R. A.
1986 Language, Human Subspeciation, and Ice Age Barriers in Northern Siberia. Canadian Journal of Anthropology 5(1):11-22.

Evidence suggests that Pleistocene barriers influenced language distribution and human biology in northern Siberia. It is hypothesized that glacial ice and ice-dammed lakes formed a barrier that could have maintained or permitted the divergence of Uralic from Altaic languages and Caucasoid from Mongoloid populations. Barriers of glacial ice appear to have had a major influence on the distribution of the Yukagir, Chukchee-Kamchatkan-Eskimo-Aleut, and Nadene linguistic groups.

Location: AEU PMC GN 1 C22
Area: Siberia, Western Beringia, Eastern Beringia
Topics: Linguistics, Human migration, Glacial history - Siberia, Glacial lake sequences

Shilo, N. A., N. N. Dikov, and A. V. Lozhkin
1968 The First Data on the Stratigraphy of the Palaeolithic of Kamchatka. Translated by R. Powers. Arctic Anthropology 5(1):204-212.

Conclusions following from the examination of the lithological, archaeological and palynological data which have come to light for the first time in the Kamchatka Palaeolithic lead to the following main positions.

1. The Ushki site represents a unique stratified archaeological site including a successive series of cultural levels from Upper Palaeolithic to Late Neolithic. Furthermore, the Upper Palaeolithic age of the three lower levels is characterized by a spore-pollen complex reflecting a vegetation cover of stony tundra.

2. Thanks to the radiocarbon dating of the remains of charcoal from cultural level V, which lay at the boundary between the Pleistocene and Holocene, it becomes evident that the transition from the former to the latter occurred in the valley of the Kamchatka River about 11 thousand years ago (10,360 $\pm$ 350).

3. The very significance of the stratified site on the shore of Ushki Lake also becomes obvious, both in archaeological respects (for correlating all of the other sites in the Northeast with its comparatively well-dated cultural levels) and also for Quaternary geology, and particularly for the stratification of the Upper Pleistocene and Holocene deposits in the Northeast of the USSR.

Notes: Conclusions used as abstract.
Location: AEU PMC GN 1 A68
Area: Western Beringia, Kamchatka
Topics: Archaeological sites - Lake Ushki, Geoarchaeology, Pollen analysis - Siberia, Lithics, Vegetation history - Siberia

Vasil'ev, S. A.

1993 The Upper Palaeolithic of Northern Asia. Current Anthropology 34:82-92.

Location: AEU PMC GN 1 C97
Area: Siberia, Western Beringia
Topics: Archaeological studies - Siberia, Archaeological sites - Siberia, Archaeological sites - Malta/Buryet, Archaeological sites - Afontova Gora, Archaeological sites - Diuktai Cave, Lithics, Lithic affinities, Cultural traditions - Diuktai, Cultural traditions - Afontova, Archaeological sites - Kokorevo

Vasilevsky, R. S.

1976 The Pacific Microlithic Traditions and their Central-Asian Roots. Translated by I. Laricheva. In *Colloque 7, Le Paléolithique Inférieur et Moyen en Inde, en Asie Centrale, en Chine et dans le sud-est Asiatique*, edited by A. K. Ghosh, pp. 131-153. Union Internationale des Sciences Préhistoriques et Protohistoriques, IX^e^ Congrès, Nice, France, 13-18 Septembre 1976.

Location: AEU HSS GN 772.3 A1 I62
Area: Siberia - eastern, Western Beringia, Mongolia, Japan, Kamchatka
Topics: Archaeological sites - Siberia, Archaeological sites - Osinovka, Archaeological sites - Lake Ushki, Archaeological sites - Japan, Archaeological sites - Japan - Hokkaido, Archaeological sites - Anangula, Archaeological sites - Mongolia, Lithics, Lithic affinities, Human migration

Vasilievskii, R. S.

1989 Primore (Soviet Maritime District) and Sakhalin Island During the Pleistocene-Holocene and the Transition to Maritime Economies in the North Pacific Region. In *Circum-Pacific Prehistory Conference, Seattle, Washington, August 1-6 1989, Reprint Proceedings.* 9 pp., preceded by the abstract. Session II. Human Occupation of the Pacific Continents/Islands. A. Routes into the New World. Theme: Cultural Development in the Context of Circum-Pacific Cultural Interaction Sphere. Session organizer: R. E. Ackerman.

The region under discussion includes the northwestern littoral of the Sea of Japan, the Ussuri-Hankan Plain, the southeastern face of the Sikhote-Alin mountain system and Sakhalin Island. Here, Upper Paleolithic cultures developed against the background of sharp and repeated natural and climatic changes and fluctuations in sea level. ...

In southern Primore, blade technology is most expressively represented at the Ustinovka Site. The site is located in the Zerkal'naya valley, on a 14-m terrace, overlooking a river bed. Cultural remains lie within three layers of light-brown to brown loams, which are contained within a Late Pleistocene deposit. The maximum thickness of these soil horizons is 1.4 to 1.5 m. A general analysis of the stone industry of Ustinovka indicates that blades and blade-like flakes were used as tool preforms. The latter were struck from cores with parallel, subparallel and radial patterns of flaking. Different varieties of wedge-shaped cores were developed. The tool assemblage is rather impressive. It consists of end scrapers, unifacially flaked points, knives, medial and transversal burins, perforators and spoke-shaves. There are bifaces in the upper cultural layer and large skreblos in the lower one. ...

The topography of the Ustinovka site, the tool assemblage, with cutting instruments predominant, testify to the fact that its population was engaged in the exploitation of the riverine zone, mainly in the harvesting of salmon. Such a

subsistence pattern is also typical of the sites located in the Takoe valley, as well as those on the Oshima Peninsula and on Hokkaido Island (Ubetsu River valley) dated between 17,000 - 12,000 years ago. According to paleoenvironmental data, roughly similar natural and climatic conditions prevailed in the northern part of the Pacific Basin, from Japan up to Alaska at the end of the Pleistocene. With the reduction in the variety of large Pleistocene mammals, hunters were forced to shift to new economic patterns and adopt the use of marine resources.

The mouths of such rivers as Amur, Kamchatka, Yukon, Kuskokwim and others (their drainage basins being free of ice) were rich in fish, including salmon. These circumstances were favorable for the development of harvesting salmon by the Upper Paleolithic population of the region. Thus, for example, in Kamchatka, at the Ushky I and V Sites, dated by 10,860 + [sic] 400 and 10,760 + [sic] 110 years ago, accumulations of burnt bones of salmon have been found within the hearths of dwellings. ...

The similarity of the stone industries in Primore, Sakhalin and Hokkaido islands, Kamchatka Peninsula and the Aleutian Islands indicates the inter-relationships of the ancient cultures of this region.

Notes: Abstract abbreviated.
Area: Western Beringia, Siberia - eastern, Sakhalin, Korea, Japan - Hokkaido, Kamchatka
Topics: Archaeological sites - Siberia - southeastern, Archaeological sites - Lake Ushki, Lithics, Faunal remains - fish, Lithic affinities, Sea level changes, Pollen analysis, Stratigraphy

Vasilievsky, R. S.

1981 On some Peculiarities of Cultural Development of North Asia Pacific Coast in the Stone Age. In *Comision IX, Cultura Y Medio Ambiente del Hombre Fosil en Asia*, edited by A. K. Ghosh, pp. 179–183. Union Internacional de Ciencias Prehistoricas Y Protohistoricas, X Congreso, Mexico, Octubre 19-24, 1981.

Location: AEU HSS GN 701 P97
Area: Western Beringia, Siberia - southeastern
Topics: Archaeological sites - Siberia - southeastern, Lithics, Faunal remains - Siberia, Bone modification

Velichko, A. A., and E. I. Kurenkova

1990 Environmental Conditions and Human Occupation of Northern Eurasia During the Late Valdai. In *The World at 18 000 BP, Volume 1, High Latitudes*, edited by O. Soffer and C. Gamble, pp. 255-265. Unwin Hyman, London, England.

The most important feature of palaeoenvironmental conditions in northern Eurasia around the LGM was the presence of open landscapes over permanently frozen ground. While it would seem reasonable to assume that Upper Palaeolithic groups would have shifted their settlements south of this zone of severe climate, data on hand indicate that exactly the opposite occurred, and that human occupation of this area intensified during the coldest part of the Valdai glaciation. This indicates that the extremely harsh conditions present in northern Eurasia (which have no modern-day analogues) did not serve as a deterrent to human occupation. Since the archaeological record shows that the entire Valdai periglacial zone was occupied, hunter-gatherer groups living at this time apparently easily overcame those barriers which kept their Middle Pleistocene predecessors out of the study area during considerably milder times.

The density of human occupation may have decreased somewhat for a short time around the LGM. It is interesting to note that the arid areas of the USSR, including even the Caucasus - those regions which showed maximal population densities at the close of the Valdai and during the earliest part of the Holocene - also may have seen a considerable reduction in human population or even total abandonment during the LGM.

These spatio-temporal fluctuations in human occupation may well have resulted from hunting practices oriented to the exploitation of large-sized herbivores that primarily occupied periglacial tundra-steppes and steppes. This narrow subsistence specialization made it necessary for human groups to inhabit regions with the most severe climatic and environmental conditions and to constantly refine their technological and adaptive skills to survive in extremely rigorous environments.

Notes: Conclusions used as abstract.
Location: AEU HSS GN 741 W928
Area: Siberia, Western Beringia
Topics: Climate history - Western Beringia, Vegetation history - Western Beringia, Archaeological sites - Siberia, Archaeological sites - Afontova Gora, Archaeological sites - Malta, Archaeological sites - Berelekh, Archaeological sites - Diuktai Cave, Archaeological sites - Kokorevo, Human migration, Faunal remains - *Mammuthus*, Faunal remains - *Bison*, Faunal remains - *Rangifer*, Faunal remains - *Equus*

Vereshchagin, N. K.

1967 Primitive Hunters and Pleistocene Extinction in the Soviet Union. In *Pleistocene Extinctions: The Search for a Cause*, edited by P. S. Martin and H. E. Wright Jr., pp. 365-398. Volume 6 of the Proceedings of the VII Congress of the International Association for Quaternary Research. Yale University Press, New Haven, Connecticut.

Archaeological investigations undertaken in the ranges of the U.S.S.R. have yielded very important documentary material for studying the mammalian fauna. In different Pleistocene epochs nearly all the U.S.S.R. was inhabited by the mammoth fauna, characterized by mammoth, cave hyena, cave lion, horse, reindeer, giant and red deer, bison, saiga, etc. In the Russian plain, along the rivers in Siberia, in karst regions of the Crimea, Caucasus, the Urals, Middle Asia, East Siberia, and the Far East, game animals were used by Paleolithic and later tribes. Numerous remains found in the Crimea and in the Ukraine testify to the hunting for large animals.

The largest sites of the Upper Paleolithic are estimated by radiocarbon to be 9,000-14,000 years old.

At the boundary between the Paleolithic and Neolithic, complex changes in the fauna and ecological assemblages of different areas took place. About ten species of large Pleistocene mammals became extinct in the U.S.S.R. Other species underwent a reduced distributional range in the Holocene. Some species, having expanded their range into the taiga, increased their populations (moose, brown bear, beaver). In the Neolithic, man began to exploit fish and marine mammals.

The main reason for the absolute extinction of animals of the mammoth complex and for the reduction of range in some species is the change in climate and terrain, especially the change in the regime of winter weather. The destructive effect of man supplemented and intensified the influence of climatic factors.

Location: AEU SCI QE 741 P715
Area: Siberia, Western Beringia
Topics: Archaeological sites - Siberia, Faunal remains - *Canis lupus*, Faunal remains - *Vulpes vulpes*, Faunal remains - *Vulpes lagopus*, Faunal remains - *Crocuta spelaea*, Faunal remains - *Leo spelaea*, Faunal remains - *Gulo gulo*, Faunal remains - *Martes zibellina*, Faunal remains - *Mammuthus primigenius*, Faunal remains - *Lepus timidus*, Faunal remains - *Marmota*, Faunal remains - *Dicerorhinus tichorhinus*, Faunal remains - *Equus caballus*, Faunal remains - *Equus hemionus*, Faunal remains - *Cervus elaphus*, Faunal remains - *Rangifer tarandus*, Faunal remains - *Capreolus pygargus*, Faunal remains - *Alces alces*, Faunal remains - *Saiga tatarica*, Faunal remains - *Capra sibirica*, Faunal remains - *Ovis ammon*, Faunal remains - *Bison priscus*, Faunal remains - *Spirocerus kiakhtensis*, Faunal remains - *Poëphagus baikalensis*, Lithics, Taphonomy, Faunal associations, Faunal extinction

Yi, S., and G. Clark

1985 The "Dyuktai Culture" and New World Origins. Current Anthropology 26:1-20.

The chronology and affinities of the "Dyuktai culture," an Upper Paleolithic assemblage from northeastern Siberia, are discussed. Geoarchaeological and chronometric data suggest that Dyuktai assemblages are no older than the middle part of the early Sartan Glacial (ca. 18,000 B.P.) and are substantially younger than claimed in the Russian literature. Since Dyuktai assemblages have been argued to resemble those of the New World Paleo-Arctic tradition, the reassessment of the age of the assemblage affects ideas about the processes and timing involved in the peopling of the Americas.

Notes: For further discussion and criticism see Current Anthropology 26: 401-404.
Location: AEU PMC GN 1 C97
Area: Western Beringia, Siberia, Kamchatka
Topics: Archaeological studies, Archaeological studies - Siberia, Cultural traditions, Cultural traditions - Diuktai, Cultural traditions - Malta/Afontova, Archaeological sites - Siberia, Archaeological sites - Diuktai Cave, Archaeological sites - Berelekh, Archaeological sites - Lake Ushki, Archaeological sites - Osinovka, Archaeological sites - Malta/Buryet, Archaeological sites - China - northern, Archaeological sites - Shiyu, Archaeological sites - Xiachuan, Archaeological sites - Hutouliang, Lithics, Lithic affinities, Geoarchaeology, Climate history, Glacial history, Pollen records, Plant macrofossils, Dating - radiocarbon, Human migration, Faunal associations, Faunal remains - *Mammuthus primigenius*, Faunal remains - *Coelodonta antiquitatis*, Faunal remains - *Bison priscus*, Faunal remains - *Equus caballus*, Faunal remains - *Rangifer tarandus*, Faunal remains - *Vulpes vulpes*, Faunal remains - *Alopex lagopus*, Faunal remains - *Cervus elaphus*, Faunal remains - *Canis lupus*

PART 6. MODERN BIOGEOGRAPHY

Matys, E. G., and L. A. Glushkova

1986 Orthoptera and Cassidinae: Zoogeographic Peculiarities of Northeastern USSR and the Role of Beringia in the Formation of Recent Insect Faunas. Translated by R. Chakravarty. In *Beringia in the Cenozoic Era*, edited by V. A. Kontrimavichus, pp. 546-554. Russian Translation Series No. 28. A. A. Balkema, Rotterdam, The Netherlands.

General distributional features characteristic of numerous insect taxa from herbaceous habitats and some known facts concerning their specific physico-geographic environments force us to distinguish, within the Euro-Siberian subzone of the Palearctic, a special zoogeographic region lying to the east of the Verkhoyansk and Djukdjur ranges (Kamchatka inclusive), which the authors call the "Neo-Beringian Province". The fauna of this province, in addition to certain specific features, is chiefly characterized by negative signs, i.e. marked impoverishment compared to adjacent Asian territories.

An analysis of the landscape distribution and genetic composition of Orthoptera and the geographic distribution of Cassidinae showed that the Bering Land Bridge may have been a link between Asia and America in late geological times only for the producers of forms originating from the Angara and Beringia centers. For more ancient faunas the climatic barrier around Beringia proved to be insurmountable from the Early Neogene. Finds of Manchurian and Japanese relicts in Kamchatka do not contradict this, since they apparently represent more labile elements of relatively thermophilic faunas hat survived in certain Neo-Beringian refuges. Facts indicating to the presence or absence in recent fauna of representatives of definite taxa and their specific biotopes may serve as additional zoogeographic criteria for a more exact determination of the geological times during which Beringian connections existed. Hence the Neo-Beringian Province may be regarded as an "indicator country" in zoogeography.

Notes: Translation of *Beringiya v Kainozoe*, Vladivostok, 1976. Collection of papers presented at the All-Union Symposium "The Bering Land Bridge and its Role in the History of Holarctic Floras and Faunas in the Late Cenozoic" held at Khabarovsk in May, 1973.
Location: AEU POLAR 56:(*3) KON
Area: Western Beringia, Siberia - eastern, Kamchatka
Topics: Faunal migration, Zoogeography - insects

Yurtsev, B. A.

1982 Relics of the Xerophyte Vegetation of Beringia in Northeastern Asia. In *Paleoecology of Beringia*, edited by D. M. Hopkins, J. V. Matthews Jr., C. E. Schweger and S. B. Young, pp. 157-177. Academic Press, New York, New York.

Large and small tracts of steppe and tundra-steppe vegetation are scattered widely in the more continental parts of northeastern Siberia. Soils in these steppe and tundra-steppe areas share common features, including base saturation, lime-accumulation horizons, and a humic horizon involving saturation with plant roots rather than accumulation of surficial peat. A study of the character and distribution of these arctic steppe tracts provides insight into the former character of Beringian vegetation during late Pleistocene cold intervals when glaciers were expanded and sea level was at its lowest.

Steppe vegetation covers large areas in the Yana and Indigirka drainage basins. In the most arid and continental part of this region, larch forests are restricted to north slopes and especially moist sites with other exposures. Steppe vegetation commonly replaces burned-over larch woodlands, suggesting that climatic conditions may have been more optimal for woodlands at some past time in the Holocene.

Steppe patches diminish in size and abundance eastward, but nevertheless, steppe and tundra-steppe vegetation are found on many sunny, well-drained sites in the Kolyma and Anadyr River basins and in an arctic belt extending eastward through the Anyui Mountains and northern Chukotka. The surprising presence of islets of steppe vegetation on favorable sites amidst the hypoarctic tundra of northern Chukotka may reflect the absence of larch and stone pine, which otherwise might be expected to colonize these drier, warmer sites. Several endemic species of very local distribution and several spectacular range disjunctions suggest that the small steppe patches of Chukotka may have expanded recently from even more restricted areas during an earlier, more mesic part of the Holocene.

Especially significant are large tracts of tundra-steppe on Wrangel Island, a large island on the continental shelf well north of the northeast Siberian mainland. The interior and the southwestern parts of the island are covered largely by a mosaic of tundra-steppe and cryophytic meadow steppe with low willow thickets in the valleys. A recent pollen spectrum from one of the steppe-tundra tracts resembles the herb zone spectra encountered in pollen sequences that extend back

to late Pleistocene levels. The vegetation of Wrangel Island may be the closest living analog to the sort of vegetation that clothed northern Beringia during Pleistocene time.

Location: AEU SCI QE 720 W47, AEA PMA/ASA 560.45 P174
Area: Siberia - eastern, Wrangel Island, Siberia - northeastern, Western Beringia, Wrangel Island, Chukotka
Topics: Beringian vegetation, Treeline fluctuations - arctic, Modern biogeography, Plant migration

SECTION D. NORTHEAST CHINA

PART 1. GENERAL

Aigner, J. S.

1972 Relative Dating of North Chinese Faunal and Cultural Complexes. Arctic Anthropology 9(2):36-79.

The major geological units identified for Pleistocene China and their associated faunas form the basis for the relative dating sequence established in China during the 1930's. The sequence is still conspicuously prominent in Chinese archaeological and palaeontological literature as the basis for dating faunas and associated cultural remains (see Chang 1968).

Geomorphological data from adjacent regions, particularly Siberia, and palynological reconstructions of Pleistocene vegetation formations suggest that the geological-palaeontological scheme which is in general use in China and the pluvial-interpluvial sequence derived from it are oversimplistic. Drawing upon data from original Chinese faunal lists and lists from localities studied during the last 20 years, and upon evidence suggested by comparisons with current European sequences, a more refined relative dating of traditional Chinese geological sections and faunas, and of palaeontological and archaeological stations and sites, is provided.

Results of these studies on faunal evolution in Pleistocene China are summarized in Appendices 1A-1D. Relative dating of associated cultural remains is indicated in the Appendices and summarized in Table 5. Detailed information on the content of the cultural stations and sites, with extensive references, may be found in Aigner 1969 and n.d.

Location: AEU PMC GN 1 A68
Area: China, China - northern
Topics: Review of pollen records - China, Review of faunal remains - China, Sea level changes, Climate history, Review of glacial history - China, Review of vegetation history - China, Loess, Archaeological sites - China, Faunal associations

1981 Pleistocene Prehistory and Biogeographic Regions in North China. In *Comision IX, Cultura Y Medio Ambiente del Hombre Fosil en Asia*, edited by A. K. Ghosh, pp. 184-203. Union Internacional de Ciencias Prehistoricas Y Protohistoricas, X Congreso, Mexico, Octubre 19-24, 1981.

Location: AEU HSS GN 701 P97
Area: China - northern
Topics: Vegetation history - China, Pollen records - China, Archaeological sites - Zhoukoudian, Archaeological sites - China - northern, Lithics, Archaeological sites - Ku-hsiang-t'un, Archaeological sites - Shiyu, Cultural traditions

Cui Zhi-jiu, and Xie You-yu

1985 On Late Pleistocene Periglacial Environments in the Northern Part of China. In *Quaternary Geology and Environment of China*, edited by Liu Tung-Sheng, pp. 226-232. Quaternary Research Association of China, China Ocean Press, Beijing, China.

Judging from chronological data and stratigraphic correlation, in addition to records of periglacial phenomena, results of palynological analysis and studies on fauna and sealevel changes, the periglacial environments in the northern part of China during the later period of late Pleistocene are summarized.

Notes: First published in China in 1982. Republished 1985 and distributed by Springer-Verlag, Berlin.
Location: AEU SCI QE 696 Q1197
Area: China - northern
Topics: Glacial history - China, Stratigraphy, Loess, Periglacial features, Vegetation history - China, Faunal remains, Pollen records, Climate history - China, Permafrost

Ren Mei'e, Yang Renzhang, and Bao Haosheng

1985 ***An Outline of China's Physical Geography*. Translated by Zhang Tingquan and Hu Genkang. China Knowledge Series. Foreign Languages Press, Beijing, China. 471 pp.**

Notes: Catalogued under Jen Mei-o.
Location: AEU SCI GB 316 O94
Area: China
Topics: Climate - China, Review of physical geography - China, Biogeography - China

Winkler, M. G., and P. K. Wang

1993 The Late-Quaternary Vegetation and Climate of China. In *Global Climates Since the Last Glacial Maximum*, edited by H. E. Wright Jr., J. E. Kutzbach, T. Webb III, W. F. Ruddiman, F. A. Street-Perrott and P. J. Bartlein, pp. 221-264. University of Minnesota Press, Minneapolis, Minnesota.

Area: China, Japan
Topics: Review of vegetation history - China, Review of pollen records - China, Climate reconstruction, Modern biogeography - China, Human/hominid remains, Archaeological sites - China, Lake level changes, Sea level changes, Foraminifera, Sea surface temperature, Glacial history - China, Ostracodes, Molluscs - freshwater, Loess, Palaeosols, Periglacial features

Zhao Songqiao

1986 ***Physical Geography of China*. Science Press, Beijing, China, and John Wiley and Sons, New York, New York. 209 pp.**

Notes: Catalogued under Chao Sung-ch'iao.
Location: AEU SCI GB 316 C46, EPL 915.102 CHA
Area: China
Topics: Climate - China, Review of physical geography - China, Biogeography - China

Zhao Xitao, Sun Xiuping, Zhang Yingli, and Huang Xinggen

1984 Paleogeographic Evolution of the Beijing Plain During the Past 30,000 Years. Scientia Sinica (Series B) 27(11):1183-1196.

Based on the landforms, sedimentary sequence, fossil fauna and flora, and paleoclimate reflected by them as well as ^{14}C datings, the Late Quaternary strata in Beijing Plain can be divided into six members. In this paper, the history of paleogeographic evolution and the interaction between geographic elements of this area during the past 30,000 years are described in detail.

Location: AEU SCI Q 1 S4183
Area: China - northern
Topics: Geomorphology, Stratigraphy, Pollen analysis, Vegetation history - China, Climate history - China, Dating - analysis of radiocarbon dates

Zhou Ting-ru

1985 Changes of Natural Zones in China Since the Beginning of Cenozoic Era. In *Quaternary Geology and Environment of China*, edited by Liu Tung-sheng, pp. 176-184. Quaternary Research Association of China, China Ocean Press, Beijing, China.

This paper deals with the paleogeography of China paying special attention to the shifting of the natural zones and notable climatic changes as well as to the general tendency of climatic development during the Cenozoic time. Such changes were considered mainly with regard to the intensive tectonic movement and the influence of the Quaternary glaciation. The author gives a brief picture for the zonality of Oligocene time of China as an example of Early Tertiary.

Important changes are dealt with changes of environment in areal differentiation at various ages in China during Late Tertiary and Quaternary Time.

Notes: First published in China in 1982. Republished 1985 and distributed by Springer-Verlag, Berlin.
Location: AEU SCI QE 696 Q1197
Area: China - eastern
Topics: Climate history - China, Loess, Vegetation history - China, Lithics, Tectonism

PART 2. LATE QUATERNARY GEOLOGY

An, Z., G. J. Kukla, S. C. Porter, and J. Xiao
1991 Magnetic Susceptibility Evidence of Monsoon Variation on the Loess Plateau of Central China During the Last 130,000 Years. Quaternary Research 36:29-36.

The magnetic susceptibility of loess and paleosols in central China represents a proxy climate index closely related to past changes of precipitation and vegetation, and thus to summer monsoon intensity. Time series of magnetic susceptibility constructed for three loess-paleosol sequences in the southern part of the Chinese Loess Plateau document the history of summer monsoon variation during the last 130,000 yr. They correlate closely with the oxygen isotope record of stages 1 to 5 in deep-sea sediments. Soils were forming during intervals of strong summer monsoon, whereas loess units were deposited at times of reduced monsoon intensity. The Chinese loess-paleosol sequence can thus be viewed as a proxy record of Asian monsoon variability extending over the last 2.5 myr.

Location: AEU SCI QE 696 Q24
Area: China - north-central
Topics: Magnetic susceptibility, Loess, Palaeosols, Climate history - China, Pollen records - China, Stratigraphy

An Zhisheng, Liu Tunghseng [sic], Lu Yanchou, S. C. Porter, G. Kukla, Wu Xihao, and Hua Yingming
1990 The Long-Term Paleomonsoon Variation Recorded by the Loess-Paleosol Sequence in Central China. Quaternary International 7/8:91-95.

The loess-paleosol sequence in Central China during the last 2.5 Ma is a good record of the Asian monsoon variation, which could be considered as the concrete realization of global paleoclimatic cycles. The geological and biological evidence of the loess-paleosol sequence indicates that the loess was mainly the dust deposits transported by the northerly wind of winter monsoons and also suffered to some extent from pedogenesis caused by weakened summer monsoons, and that the paleosol accreted by the rather slow dust accumulation was closely related to strengthened summer monsoons. An alternating occurrence of loess and paleosol in the Luochuan section implies the variation history of warm-humid climate with a summer monsoon dominance and cold-dry climate with a winter monsoon dominance. The magnetic susceptibility of loess and paleosol can be regarded as a proxy index of Asian monsoon variation. An analysis of the susceptibility curve and structure characters of Luochuan section shows that the Asian monsoon circulation was strengthened from Early Pleistocene to Late Pleistocene, and the 500 ka BP point and 1200 ka BP point seen to be a threshold and a turning point respectively in terms of the long-term paleomonsoon variation in Asia.

Location: AEU SCI QE 696 Q229
Area: China - north-central
Topics: Climate history - China, Loess, Palaeosols, Palaeowinds, Stratigraphy, Magnetic susceptibility

An Zhisheng, S. C. Porter, Zhou Weijian, Lu Yanchou, D. J. Donahue, M. J. Head, Wu Xihuo, Ren Jianzhang, and Zheng Hongbo
1993 Episode of Strengthened Summer Monsoon Climate of Younger Dryas Age on the Loess Plateau of Central China. Quaternary Research 39:45-54.

The Baxie loess section, just east of the Tibetan Plateau, contains evidence showing that the Asian monsoon climate experienced an abrupt reversal near the end of the last glacial age. Rapid deposition of dust under cool, dry full-glacial conditions gave way to an interval of soil development and reduced dust influx attributed to a strengthening of the warm, moist summer monsoon. A subsequent abrupt increase in dust deposition, a response to a weakening of the summer monsoon, was later followed by renewed soil formation as summer monsoon circulation again intensified during the early Holocene. By one interpretation, the thin upper loess is a manifestation of the European Younger Dryas oscillation; however, in this case the available ^{14}C ages require either that (1) onset of loess deposition lagged the beginning of the Younger Dryas event in Europe by as much as 2000 calibrated ^{14}C years or (2) all the ^{14}C are too young, possibly due to contamination. Alternatively, the late-glacial paleosol, the top of which is synchronous with the abrupt end of the late-glacial $\delta^{18}O$ anomaly in the Dye 3 Greenland ice core, records the Younger Dryas event. Such an interpretation is consistent with general circulation model simulations of Younger Dryas climate that show strong seasonality and a

strengthened summer monsoon, and with marine cores from the western Pacific Ocean that contain evidence of pronounced cooling of surface waters during Younger Dryas time.

Location: AEU SCI QE 696 Q24
Area: China - north-central
Topics: Loess, Palaeosols, Stratigraphy, Loess - dating, Dating - TL, Climate history - China, Ocean cores, Dating - analysis of radiocarbon dates, Magnetic susceptibility

Banerjee, S. K.

1992 Paleoclimatic Record of Chinese Loess: Potential for High Resolution Record Recovery from the Western Loess Plateau. In *AMQUA, 12th Biennial Meeting, Davis, California, Program and Abstracts*, p. 5.

Area: China - north-central
Topics: Loess, Palaeosols, Palaeomagnetism

Burbank, D. W., and Li Jijun

1984 The Age of the Loess of North-Central China: A Magnetic-Polarity Stratigraphy from Lanzhou, P.R.C. In *AMQUA, 8th Biennial Meeting, Boulder, Colorado, Program and Abstracts*, p. 18.

Area: China - north-central
Topics: Loess, Palaeomagnetism, Loess - dating, Palaeosols

1985 Age and Paleoclimatic Significance of the Loess of Lanzhou, North China. Nature 316:429-431.

Extending in a broad arc that abuts the sandy (non-Gobi) deserts, the loess plateau of northern China is one of the most massive accumulations of loess in the world. The loess sequence is typically characterized by an alternation of silty or sandy loess with more clay-rich palaeosols. These alterations, in conjunction with their enclosed faunas and distinctive mineralogies, have been interpreted as reflecting Pleistocene glacial/interglacial cycles. Because it holds implications for the climatic and anthropological history of China, the definition of a reliable chronological framework for loess deposition is of great interest. Recent palaeomagnetic studies have indicated that loess deposition in Shaanxi province commenced ~2.4 Mya. To assess the synchrony of loess accumulation across the loess plateau, we have dated a 330-m-thick loess sequence near Lanzhou, Gansu province. The magnetostratigraphical results reported here indicate that the base of this loess succession dates from ~1.3 Mya ago. This young age (in comparison to the Shaanxi sequence) is attributed to uplift along the northern fringe of the Tibetan Plateau that precluded early Pleistocene loess preservation in this mountainous region. Palaeosols in the basal loess occur, on average, once every 25 kyr, suggesting that climates conducive to soil-forming events may have been modulated by orbital precession in the early Pleistocene.

Notes: Footnotes omitted from abstract.
Location: AEU SCI Q 1 N28
Area: China - north-central
Topics: Loess, Palaeomagnetism, Loess - dating, Palaeosols, Climate history - China

Chen Ming

1985 Features of Distribution of the Quaternary in China. In *Quaternary Geology and Environment of China*, edited by Liu Tung-sheng, p. 27. Quaternary Research Association of China, China Ocean Press, Beijing, China.

Notes: First published in China in 1982. Republished 1985 and distributed by Springer-Verlag, Berlin.
Location: AEU SCI QE 696 Q1197
Area: China
Topics: Stratigraphy, Loess

Chu Ben Jun

1991 Several Questions of Quaternary Geology about Sanjiang Plain of Heilong-Jiang Province, China. In *INQUA, 13th International Congress, Beijing, China, Abstracts*, p. 60.

Area: China - northeastern
Topics: Stratigraphy, Tectonism

Derbyshire, E.

1987 A History of Glacial Stratigraphy in China. Quaternary Science Reviews 6:301-314.

Glacial stratigraphy had a late start in China, and it fell to Li Szeguang, an outstanding geologist with a little experience of the European Alps, to inject a systematic approach into the study of Chinese Pleistocene glacial stratigraphy starting in the early 1920s. Several diamictons in low latitude mountains of E. China were attributed to glaciation. A formal stratigraphy had to await his detailed and long term studies of the Lushan (29°30'N) on which he based a three-fold sequence of Poyang (Gunz correlate), Da Gu (= Mindel) and Lushan (Riss). A Dali (Würm) glaciation was added on the basis of evidence from Yunnan Province. Based on much morphological and erosional evidence as well as an assumption of glacial provenance for the widespread bouldery clays, and despite early critical reviews, this work became the dominant hypothesis in Chinese glacial stratigraphy for over 50 years. Echoes of it still remain in the literature, despite mounting sedimentological evidence that the diamictons are weathered debris flow and alluvial accumulations (with some thin, high-level solifluction earths).

Increasingly, glacial stratigraphy is now being based on the glaciated west of China from Yunnan to western Xinjiang and it is here that the definitive glacial stratigraphy will be established. At least four glaciations are already authenticated in many localities in this vast region, although the resolution of this stratigraphy may never match that of the classic loess stratigraphy of Shaanxi and the yet-to-be studied stratigraphy of the thick lacustrine successions in the high desert basins of the west.

Location: AEU SCI QE 696 Q245
Area: China
Topics: Review of glacial history - China, Stratigraphy, Geomorphology, Glacial history - China

Forman, S. L.

1991 Late Pleistocene Chronology of Loess Deposition near Luochuan, China. Quaternary Research 36:19-28.

Loess near Luochuan was sampled for thermoluminescence (TL) dating simultaneously with magnetic susceptibility measurements to provide the first independent age estimates on a susceptibility record from the Loess Plateau of China. TL age estimates on late Pleistocene loess (L1) are stratigraphically consistent with no statistical difference in TL ages by the total or partial bleach techniques or by measuring ultraviolet or green wavelengths in the TL analysis. Loess below the last interglacial soil (S1) yielded disparate results and is in many localities in central and eastern China unsuitable for TL dating because of complications of TL saturation and uncertainties in estimating the environmental radiation. TL age estimates on the L1 loess are consistent with previously reported TL ages for sites near Beijing and Xian as well as in general agreement with age models for loess deposition based on paleomagnetics and magnetic susceptibility. The convergence of a variety of geochronologic indices indicate that the last major period of loess deposition in central China began 70,000 $\pm$ 10,000 yr B.P. and terminated $<$20,000 yr B.P. This event is probably recorded in sediments from the adjacent Pacific Ocean and possibly in dust records from the Antarctic Ice Sheet.

Location: AEU SCI QE 696 Q24
Area: China - north-central
Topics: Loess, Dating - TL, Loess - dating, Palaeosols, Stratigraphy, Magnetic susceptibility

Han Jia-mao

1985 A Preliminary Study on the Clay Mineralogy of the Loess at Luochuan Section. In *Quaternary Geology and Environment of China*, edited by Liu Tung-sheng, pp. 93-100. Quaternary Research Association of China, China Ocean Press, Beijing, China.

Clay mineralogy of the loess at Luochuan section, Shaanxi, was investigated, which has been shown that clay minerals in loess exhibit great complexity in aspects of their compositions and crystallinities.

Illite, kaolinite, chlorite, vermiculite and montmorillonite are all found in the loess, and mixed layers as well. The main component is illite which is assigned to the mixed layer of mica-like layers with a few expanded layers. In general, there is a little more vermiculite and less chlorite in the paleosol than in the loess. It shows that pedogenic processes took place in a humid environment favourable to the formation of the vermiculite.

By means of H_w (the ratio of the height of the reflection at 10 Å and the width of the same reflection at 1/2 height above background), the crystallinity of illite is determined, which indicates that there was a great difference of H_w between loess and paleosol. It also shows that there existed different climatic conditions when loess deposited and paleosol formed. The value of H_w, on the other hand, increases gradually from Wucheng Loess (Lower Pleistocene) through Lishi Loess (Middle Pleistocene) to Malan Loess (Upper Pleistocene). It might be related to their depositional conditions and the degree of diagenesis.

Notes: First published in China in 1982. Republished 1985 and distributed by Springer-Verlag, Berlin.
Location: AEU SCI QE 696 Q1197
Area: China - north-central
Topics: Loess - clay mineralogy, Palaeosols, Climate history - China

Heller, F., and Liu Tung-sheng

1982 Magnetostratigraphical Dating of Loess Deposits in China. Nature 300:431-433.

The age of Chinese loess deposits has long been disputed. Biostratigraphical and earlier magnetostratigraphical investigations placed the entire loess formation within the Pleistocene. The new palaeomagnetic measurements reported here on a bore hole section near Lochuan (Shaanxi province) suggest a clearly defined magnetic polarity zonation which extends below the Olduvai subchron. A late Pliocene age of ~2.4 Myr is assigned to the oldest loess sediments measured. The intensity variations of natural remanent magnetization (NMR) and low field magnetic susceptibility are indicative of climatic changes during loess deposition.

Location: AEU SCI Q 1 N28
Area: China - north-central
Topics: Loess, Loess - dating, Palaeomagnetism, Magnetic susceptibility

1984 Magnetism of Chinese Loess Deposits. Geophysical Journal of the Royal Astronomical Society 77:125-141.

The age of Chinese loess deposits has long been disputed. Biostratigraphical and earlier magnetostratigraphical investigations placed the entire loess formation within the Pleistocene and ascertained a maximum loess age of about 1.2 Myr. A new collection of nearly 500 samples from a natural outcrop and a borehole section near Lochuan (lat. 35.8°N, long. 109.2°E; Shaanxi province) has been dated by magnetic stratigraphy. Thermal cleaning of the natural remanent magnetization (NRM) removes a strong secondary component of viscous origin along the present geomagnetic field which resides largely in magnetite. The characteristic NRM component is due to haematite which is thought to be of chemical origin. Rhythmical intensity variations of NRM and initial susceptibility depend on the loess lithology and may reflect climatic changes during loess deposition.

The palaeomagnetic results are consistent between the two sections and yield a clearly defined magnetic polarity zonation. The Brunhes Matuyama boundary and the Jaramillo subchron have been positively identified in both outcrops at exactly the same stratigraphic level. The Olduvai subchron has been found in the borehole section which records the entire loess sequence. Most probably the formation of Chinese loess began shortly after the Matuyama-Gauss polarity transition. Therefore a late Pliocene age of about 2.4 Myr is assigned to the oldest loess sediments measured.

Location: AEU PHYSC QC 801 G345
Area: China - north-central
Topics: Loess, Loess - dating, Palaeomagnetism, Magnetic susceptibility, Loess - sedimentology, Palaeosols

1986 Palaeoclimatic and Sedimentary History from Magnetic Susceptibility of Loess in China. Geophysical Research Letters 13(11):1169-1172.

The magnetostratigraphic age of the oldest loess sediments in the central Chinese loess plateau investigated so far has recently been placed at ca. 2.4 million years B.P. Thus, glaciations in Central Asia, which are believed to provide the detritus for the formation of Chinese loess, commenced at the same time as the first ice-rafted debris sank into the ocean basins of the northern hemisphere. Lithologic, palaeontologic, geochemical and especially rock-magnetic variations throughout the loess column are indicative of palaeoclimatic fluctuations during loess deposition. The variations of magnetic low field susceptibility in loess closely resemble those of the marine oxygen-isotope record and establish for the first time a continuous record of the Pleistocene glacial and interglacial stages in a continental section. Spectral analysis of the rock-magnetic time series indicates slow apparent sedimentation during interglacial periods which are characterized mainly by calcium dissolution and related compaction of the soils. Variable aeolic sediment influx as well as erosion and/or polygenetic soil formation may also strongly influence the sedimentary history.

Notes: References omitted from abstract
Location: AEU PHYSC QC 801 G347
Area: China - north-central
Topics: Loess, Loess - dating, Palaeosols, Palaeomagnetism, Magnetic susceptibility, Loess - sedimentology, Climate history - China

Hu Lan-ying, Huang Bao-ren, Li Hua-mei, and Yang Liu-fa

1985 Correlation of Quaternary Strata between Inland and Coastal Areas in North China. In *Quaternary Geology and Environment of China*, edited by Liu Tung-sheng, pp. 23-26. Quaternary Research Association of China, China Ocean Press, Beijing, China.

According to the recent investigation of the writers, the Quaternary interbeds of marine and continental facies in northern coastal area of Bohai Sea contain three marine beds. Among them the lower marine bed is a mixture of marine and continental facies, and can be correlated with Middle Pleistocene lake formation such as Erlangjian formation in Qinghai Lake area and a part of Nihewan formation at Hutouliang section in North China, also with Middle Pleistocene Holsteian glacial deposits in Europe. The middle marine bed may be of Upper Pleistocene and the upper marine bed belongs to the Holocene.

Notes: First published in China in 1982. Republished 1985 and distributed by Springer-Verlag, Berlin.
Location: AEU SCI QE 696 Q1197
Area: China - eastern
Topics: Stratigraphy, Ostracodes, Molluscs, Sea level changes

Kukla, G.

1987 Loess Stratigraphy in Central China. Quaternary Science Reviews 6:191-219.

The loess deposits in central China record world-wide climate changes of the last 2.5 Ma. Numerous climatic oscillations are marked by alternating loess and soil units with continuous coverage of the Matuyama and Brunhes Epochs. Magnetic susceptibility of the deposits correlates closely with the oxygen isotope record of the deep-sea sediments and provides an independent measure of climate and time.

The key marker bed of the chinese loess sequence is the paleosol S5, the time equivalent of the mid-Brunhes oxygen isotope stages 13, 14 and 15. It marks a prolonged interval of warm humid climate lasting from approximately 615 to 470 thousand years ago. Several episodes of river downcutting coincide with the deposition of the exceptionally thick loess units L1 (oceanic oxygen isotope stages 2 to 4) L2 (stage 6), L5 (stage 12) L6, (stage 16) L9 (stage 22) L15 (stage 38 about 1.15 Ma) and WS4 (about 2.3 Ma). These erosional events are interpreted as a result of episodic uplift of the Loess Plateau.

The deposition of the earliest loess layers between 2.5 and 2.3 Ma ago marks a first order shift from warm and humid environments toward harsh continental steppes comparable to those of the Middle and Late Pleistocene. Little, if any lithologic or paleontologic changes were noted within or above the Olduvai magnetozone, so that the proposed Plio/Pleistocene boundary at approximately 1.65 Ma has no lithostratigraphic and biostratigraphic representation in the chinese loess series.

Comparison with the Deep Sea Drilling Program core 552A in the North Atlantic and with the Santerno River section near Bologna shows that the occurrence of the earliest loess in China coincides with the timing of the first significant ice rafting in the North Atlantic and with the appearance of cold water foraminifers in the marine deposits of northern Italy. An extension of the stage system of the oxygen isotope signal extended back to the Gauss-Matuyama boundary is proposed.

Location: AEU SCI QE 696 Q245
Area: China - north-central
Topics: Loess, Stratigraphy, Palaeosols, Palaeomagnetism, Molluscs, Faunal remains, Pollen records, Ocean cores, Dating - TL, Climate history - China, Stable isotopes - $\delta^{18}O$, Magnetic susceptibility

Kukla, G., F. Heller, Liu Xiu Ming, Xu Tong Chun, Liu Tung Sheng, and An Zhi Sheng
1988 Pleistocene Climates in China Dated by Magnetic Susceptibility. Geology 16:811-814.

The magnetic susceptibility of loess and interbedded soils in central China varies with the degree of pedogenesis and serves as a proxy measure of climate. The concentration of magnetic minerals in the sediment is inversely proportional to sedimentation rates throughout the Brunhes epoch. Susceptibility measurements combined with the reversal stratigraphy provide a time scale that is independent of astronomic chronology. On this scale, the susceptibility record closely parallels the oxygen-isotope fluctuations in deep-sea sediments, suggesting a close interdependence of the Chinese dust falls, the volume of land-based ice, and global climate.

Location: AEU SCI QE 1 G3455
Area: China - north-central
Topics: Loess, Palaeosols, Loess - dating, Stable isotopes - $\delta^{18}O$, Ocean cores, Magnetic susceptibility, Climate history - China

Leger, M.
1990 Loess Landforms. Quaternary International 7/8:53-61.

A thin loess layer only changes slightly the pre-loess morphology. A thick loess accumulation, however, can create original loess features, such as the loess-edge ramp in Saxony, a pattern of loess dunes forming parallel ridges or long ranges separated by features, which is present in many regions.

Among erosion landforms, gullies are the most common form - as well as the greatest hazard to the environment - to be found nowadays in loess areas, particularly those with the type of climatic conditions prevailing in continental steppes.

Last, some landforms of loess regions are the consequences of a long evolution and of a combination of many tectonic and climatic factors. Such landforms include the 'balka(s)' in southern Russia, and the loess plateau morphology in northern China.

Location: AEU SCI QE 696 Q229
Area: China - north-central
Topics: Applied geology, Loess, Geomorphology

Li Cong-xian, Li Ping, and Wang Li
1985 Postglacial Marine Beds in the Coastal and Deltaic Areas in East China. In *Quaternary Geology and Environment of China*, edited by Liu Tung-sheng, pp. 30-35. Quaternary Research Association of China, China Ocean Press, Beijing, China.

This paper mainly deals with the internal characteristics, and the formation of the postglacial marine beds, as well as the distribution regularity of the sand bodies, peats and barrier-lagoon systems within postglacial beds along coastal and deltaic areas in East China. The internal characteristics of postglacial beds along coastal zones over the world are the same as those in East China, and the other Quaternary marine beds are similar to postglacial ones in East China. The conclusion, therefore, obtained from the study of the postglacial marine beds may be useful to study the other marine beds.

Notes: First published in China in 1982. Republished 1985 and distributed by Springer-Verlag, Berlin.
Location: AEU SCI QE 696 Q1197
Area: China - eastern
Topics: Stratigraphy, Sea level changes

Li Hu-hou, and Sun Jian-zhong

1985 Age of Loess Determined by Thermoluminescence (TL) Dating of Quartz. In *Quaternary Geology and Environment of China*, edited by Liu Tung-sheng, pp. 56-59. Quaternary Research Association of China, China Ocean Press, Beijing, China.

The displaced electrons in quartz lattice can be transferred by sunlight. This is a basic characteristic of quartz for the use of TL technique to date the age of loess. We have tested this property of quartz and found it useful for the development of TL technical applications.

The main points in dating technique are mentioned, which include: 1. Shine fading; 2. Revision of the annual dose. For explanation, an age determination of loess samples in Yuangou profile is presented as an example.

Notes: First published in China in 1982. Republished 1985 and distributed by Springer-Verlag, Berlin.
Location: AEU SCI QE 696 Q1197
Area: China - north-central
Topics: Loess, Dating - TL methodology, Loess - dating

Li Huhou, and Sun Jianzhong

1986 Formation Age of Malan Loess Dated by Thermoluminescence. Scientia Sinica (Series B) 29(11):1212-1220.

Described in this paper is the basic principle of quartz thermoluminescence (TL) dating of loess. Also discussed is the effect of sunlight on the storage of energy in quartz lattice, which will be used to determine the starting point of energy storage. The application of TL technique to loess dating is based on this principle. The determined ages of loess samples from six profiles are presented, together with the data previously published. The results show that the formation age of Malan loess is 100,000 yr B. P.

Location: AEU SCI Q 1 S4183
Area: China - north-central
Topics: Dating - TL methodology, Loess - dating

Li Hua-mei, and Wang Jun-da

1985 Magnetostratigraphic Study of Several Typical Geologic Sections in North China. In *Quaternary Geology and Environment of China*, edited by Liu Tung-sheng, pp. 48-55. Quaternary Research Association of China, China Ocean Press, Beijing, China.

In the east of the Datong Basin, the beginning of loess accumulation is at about Middle Matuyama Epoch, the river-lake sediments of Yujiazhai section along the Shanggan River belong to the Middle Pleistocene. Datong volcanic rocks were mainly erupted in Brunhes epoch, at about 0.45 m.y. Lacustrine sediments in Nihewan Basin began at Kaena event with an age of 3 m.y. BP and came to the end at Brunhes Epoch, middle-late period of Middle Pleistocene, the stone implement-bearing bed within Nihewan formation is located under the basal boundary of Jaramillo event, its age is about 1 m.y. Polarity epochs and events since 3.0 m.y. were recorded in the 600 m long core from Bo 3 drill hole in Northern Bohai Coastal Plain. The stratigraphic division and correlation, and the basal boundary of the Quaternary system are discussed along with the data of isotopic chronology, paleontology and micropaleontology.

Notes: First published in China in 1982. Republished 1985 and distributed by Springer-Verlag, Berlin.
Location: AEU SCI QE 696 Q1197
Area: China - northern, China - eastern
Topics: Stratigraphy, Palaeomagnetism, Loess, Faunal remains - China

Li Jijun, Zhang Linyuan, Deng Yangxin, and Zhou Shangzhe

1984 Problems of Quaternary Environmental Evolution and Geomorphological Development in the Lushan. Scientia Sinica (Series B) 27(1):85-98.

The major Quaternary climatic deterioration of the Lushan area occurred mainly in Late Pleistocene when a periglacial environment prevailed on the high summits above 1000 m a.s.l. with resulting frost shattering and gelifluctuation. The data from sporo-pollen analysis, fossil fauna, paleosols and the elevation of the snowline in the ice ages prove that conditions for the development of the glaciers did not exist in the Lushan during early and middle Quaternary period. Evidence of former glaciation has not been found in the study on the type sedimentary sections in Yejialong and Dajiaochang gully. There are many relict landforms belonging to hot and humid tropical climate rather than to glacial one. The problems of the landform development of the Lushan are also discussed.

Location: AEU SCI Q 1 S4183
Area: China - eastern
Topics: Loess, Stratigraphy, Climate history - China, Pollen records - China, Tectonism, Periglacial features

Liu Dongsheng, and Ding Menglin

1984 The Characteristics and Evolution of the Palaeoenvironment of China Since the Late Tertiary. In *The Evolution of the East Asian Environment, Volume I, Geology and Palaeoclimatology*, edited by R. O. Whyte, pp. 11-35. Centre of Asian Studies, University of Hong Kong, Hong Kong.

Area: China
Topics: Sea level changes, Loess, Palaeomagnetism, Review of climate history - China, Vegetation history - China, Palaeosols, Tectonism

Liu Tung-sheng, and Ding Meng-lin

1985 Pleistocene Stratigraphy and Plio/Pleistocene Boundary in China. In *Quaternary Geology and Environment of China*, edited by Liu Tung-sheng, pp. 1-9. Quaternary Research Association of China, China Ocean Press, Beijing, China.

Continental Pleistocene sediments of East China can be grouped into four main different depositional stratigraphical types: the intermontane basin, the loess, the cave deposits, and the maritime plain deposits. According to the biostratigraphical, lithostratigraphical and magnetostratigraphical studies, the four main deposit types all favor to draw the Pliocene/Pleistocene boundary at a place in coincidence with the boundary of Matuyama/Gauss Epoch. This boundary corresponds with the boundaries lying between the upper and lower Nihewan series (middle and early Villafranchian), Yuanmou series (in narrow sense) and Sagou series, and also between the Wucheng Loess and the underlying Red Clay.

Notes: First published in China in 1982. Republished 1985 and distributed by Springer-Verlag, Berlin.
Location: AEU SCI QE 696 Q1197
Area: China - eastern
Topics: Stratigraphy, Loess, Faunal remains - China, Palaeomagnetism

Liu Tungsheng et al.

1985 *Loess and the Environment*. China Ocean Press, Beijing, China. 251 pp.

Based on the on-the-spot investigations, the loess-paleosol time sequence has been established, and the loess fabric and the geological events such as biological relicts, etc. have been studied by using ^{14}C, thermoluminescence, paleomagnetism, amino acid, trace element and rare earth element test, X-ray powder diffraction, micromorphology and ecological analysis of biological fossils. Proceeding from loess environmental system, climatic fluctuation sequence of different scales at 2.4 m.y. has been reconstructed, and the whole process of eolian loess accumulation and its relationship with modern silt dust, water and soil conservation, engineering geology, agricultural soil as well as local diseases are discussed.

Notes: Abstract taken from synopsis. Other authors are An Zhisheng, Chen Deniu, Chen Mingyang, Diao Guiyi, Gao Fuqing, Gao Jiaxiang, Geng Ansong, Gu Xiongfei, Han Jiamao, Hu Biru, Huang Baolin, Li Huhou, Lin Shaomeng, Liu Ruiling, Liu Tungsheng, Lu Longhua, Lu Yanchou, Qiao Yulou, Shen Chengde, Sun Fuqing, Wei Lanying, Wen Qizhong, Wu Zirong, Xiang Mingju, Yu Suhua, Yu Zhicheng, Yuan Baoyin, Zhang Shouxin, Zheng Honghan, Zheng Shaohua, Zhou Kunshu, Zhou Mingfu, and Zhu Yizhi.
Area: China
Topics: Loess, Loess - dating, Faunal remains, Pollen analysis - China, Climate history - China, Palaeosols, Molluscs, Palaeomagnetism, Loess - clay mineralogy

Liu Tungsheng, and Yuan Baoyin

1987 Megageomorphic Features and History of the Chinese Loess. In *International Geomorphology 1986 Part II*, edited by V. Gardiner, pp. 241-253. John Wiley and Sons, New York, New York.

Loess covers an area of approximately 440,000 km^2 in China, between latitudes 33° and 57°N and longitudes 75° and 125° E. The Huanghe, the Yellow River, the second largest river in China flows through the Loess Plateau, which is dissected by the river and its tributaries into a spectacular landscape, whether observed from space or earth. Soil erosion on the Loess Plateau supplies 16 x 10^9 tonnes of sediment to the Yellow River annually. The bed of the lower Yellow River aggrades about 10 cm per year creating a potential hazard for the inhabitants of the North China Plain. Geomorphological investigations are one of the most important means of understanding the devlopment [sic] of both the Loess and the North China Plain.

In the middle reaches of the Yellow River, loess forms a virtually continuous thick mantle, hence the name the Loess Plateau. We recommend that as a single geomorphological entity, because of its large extent and unique geomorphological history, the Loess Plateau be referred to as a megageomorphological unit.

Notes: Reference omitted from abstract
Location: AEU SCI GB 400.2 I614
Area: China - north-central
Topics: Loess, Palaeosols, Stratigraphy

Liu Tungsheng, Zhang Shouxin, and Han Jiaomao

1986 Stratigraphy and Paleoenvironmental Changes in the Loess of Central China. Quaternary Science Reviews 5:489-495.

Notes: Special volume, *Quaternary Glaciations of the Northern Hemisphere*, edited by V. Sibrava, D. Q. Bowen, and G. M. Richmond. Report of IGCP Project 24.
Location: AEU SCI QE 696 Q245
Area: China - north-central
Topics: Loess, Stratigraphy, Palaeosols, Faunal remains - China, Pollen records - China

Liu Ze-chun

1985 Climatostratigraphy of the Sediments in the Peking Man's Cave. In *Quaternary Geology and Environment of China*, edited by Liu Tung-sheng, pp. 36-45. Quaternary Research Association of China, China Ocean Press, Beijing, China.

The deposits in the Peking Man's Cave are more than 40 m thick. According to climatostratigraphy, the deposits of the Peking Man's Cave, the New Cave and the Upper Cave may be correlated to the L1-L12 of the loess section in Luochun, Shaanxi province, or $\delta\ ^{18}O$ 16-2 stages of the deep-sea core V28-238.

Notes: First published in China in 1982. Republished 1985 and distributed by Springer-Verlag, Berlin.
Location: AEU SCI QE 696 Q1197
Area: China - northern

Topics: Archaeological sites - Zhoukoudian, Stratigraphy, Faunal remains - China, Pollen analysis - China, Loess

Liu Zechun

1987 Development and Filling of Caves in Dragon Bone Hill at Zhoukoudian, Beijing. In *International Geomorphology 1986 Part II*, edited by V. Gardiner, pp. 1125-1141. John Wiley and Sons, New York, New York.

Dragon Bone Hill has limestone caves, in which many animal fossils, including those of Peking Man, have been found. The cave morphology is controlled by geological structure, with both vertical and horizontal types occurring; the caves formed during the Middle Miocene, Pliocene and Quaternary. Sediments in the caves include old river sediments, limestone breccia and travertines. Habitation of the caves by early man depended partly on the pattern of sedimentation and stage of cave development; this is illustrated by detailed consideration of the development of Peking Man's Cave, Upper Cave and New Cave.

Location: AEU SCI GB 400.2 I614
Area: China - northern
Topics: Archaeological sites - Zhoukoudian, Human/hominid remains, Stratigraphy, Faunal remains - China

Lu Yanchou, A. J. Mortlock, D. M. Price, and M. L. Readhead

1987 Thermoluminescence Dating of Coarse-Grain Quartz from the Malan Loess at Zhaitang Section, China. Quaternary Research 28:356-363.

Thermoluminescence (TL) ages were obtained for five loess samples taken from the Zhaitang section near Beijing, China, using the coarse-grain quartz technique. The paleodose values have been determined by the method of total sample bleaching and regeneration of the TL growth curve. The method appears to be suitable for the age determination of loess samples up to about 150,000 yr where the annual dose-rate values are of the order 3-4 mGy/yr. This limit is a function of the total accumulated dose. The ages are in good agreement with those obtained by a fine-grain TL technique and are consistent with geological and geomagnetostratigraphic evidence.

Location: AEU SCI QE 696 Q24
Area: China - north-central
Topics: Loess, Loess - dating, Dating - TL methodology, Stratigraphy

Lu Yanchou, Zhang Jingzhao, and Xie Jun

1988 Thermoluminescence Dating of Loess and Palaeosols from the Lantian Section, Shaanxi Province, China. Quaternary Science Reviews 7:245-250.

Ten samples of loess and palaeosol collected from the upper part of Lantian section, Shaanxi, have been dated using the fine grain (4-11 μm) TL technique. Palaeodose values were determined by the regeneration method (Readhead, 1982). The TL ages obtained ranged from 2.4×10^4 years for the upper Malan Loess L_1 to 1.5×10^5 years for the upper part of loess L_2 of the Lishi Loess. Fine grain TL dating does not seem to be suitable for the samples older than 150 ka. The uncertainty of the TL age estimate, especially for the palaeosol sample, may be primarily an effect of disequilibrium of the ^{238}U decay chain and of water content variations since deposition of sediments.

Location: AEU SCI QE 696 Q245
Area: China - north-central
Topics: Loess, Loess - dating, Dating - TL, Palaeosols, Stratigraphy

Maher, B. A., and R. Thompson

1992 Paleoclimatic Significance of the Mineral Magnetic Record of the Chinese Loess and Paleosols. Quaternary Research 37:155-170.

The origins of the magnetic susceptibility variations of the Chinese loess and paleosols are explored by scanning and transmission electron microscopy of magnetic extracts, and by magnetic modeling of magnetic hysteresis data, to provide quantified estimates of the major magnetic components. Microscopy identifies several distinct size and shape characteristics in the magnetic carriers. Lithogenic magnetites, intact and abraded, dominate the coarse-grained magnetic fraction. The smallest of the coarse grains is $\sim 2\ \mu m$. The remaining magnetic material is ultrafine in size, with two types of magnetite particles present. Type A particles strongly resemble soil magnetites produced by inorganic precipitation. Type B particles, which occur rarely, are probably bacterial in origin. Quantitative modeling of these magnetic assemblages shows that over 90% of the susceptibility variations is accounted for by the superparamagnetic magnetite component. Compared to the loess units, the paleosols are richer in magnetite, particularly of superparamagnetic size, and have a threefold higher ratio of magnetite to hematite. We identify pedogenic formation of magnetite as a major contributor to the loess magnetic record. Matching this record against other paleoclimatic records, we find an extremely high correlation with the standard ^{18}O record. The Chinese loess sequences record a very high resolution magnetic stratigraphy directly related to changing climate.

Location: AEU SCI QE 696 Q24
Area: China - north-central
Topics: Loess, Palaeosols, Magnetic susceptibility, Stable isotopes - $\delta^{18}O$, Ocean cores, Palaeomagnetism, Climate history - China

McCoy, W. D., and R. S. Bradley

1988 Quaternary Aminostratigraphy of Loess in Northern Shaanxi and Eastern Gansu Provinces, China. In *AMQUA, 10th Biennial Meeting, Amherst, Massachusetts, Program and Abstracts*, p. 136.

Location: AEU HSS QE 696 A5212
Area: China - north-central
Topics: Dating - amino acid, Loess, Palaeosols, Climate history - China, Molluscs

Pei Wen-chung, and Li Yiu-heng

1964 Some Tentative Opinions on the Problem of "Sjara-osso-gol Series". Vertebrata PalAsiatica 8(2):99–118.

If we go back to the known literatures, we may find out that the term "Sjara-osso-gol Formation or Series" was not formally proposed by P. Teilhard de Chardin, nor by any other geologist. However, since long time ago, Chinese Quaternary geologists always consider that it is a name of a special geological formation of stratigraphical, palaeontological and archaeological importance. But since that we have learned that Chinese Quaternary geologists have very widely divergent opinions, concerning the geological age and mode of deposition of this interesting formation, we may expect that hot controversy will be raised, like in the case of "Sanmenian" or "Sanmen Series" of early Pleistocene.

Notes: Introductory paragraph of summary used as abstract.
Area: China - northern
Topics: Palaeontological sites - Salawusu, Stratigraphy, Molluscs - freshwater, Geomorphology - terraces, Faunal remains - *Camelus*, Faunal remains - *Equus*, Faunal remains - *Rhinoceros tichorhinus*
Language: Chinese with English summary on pp. 116-118.

Porter, S. C., An Zhisheng, and Zheng Hongbo

1992 Cyclic Quaternary Alluviation and Terracing in a Nonglaciated Drainage Basin on the North Flank of the Qinling Shan, Central China. Quaternary Research 38:157-169.

Pleistocene alluvial terraces of the nonglaciated Ba River drainage basin on the north flank of the Qinling Shan are capped by a succession of loess units and paleosols that correlate with the standard marine isotope chronology and are used to date the subjacent alluvial gravels. Alluvial fills were deposited during isotope stages 2, 6, 8, 12, and 16, whereas terracing occurred during interglacial stages 1, 5, 7, 11, and 15. The apparent absence of terraces dating to stage 14 and stage 4 may be due to the lesser intensity of these glaciations compared to that of stage 2, although disruption of the alluvial regime by local tectonism is a likely alternative for the lack of a stage 4 terrace. A stage 10 terrace was not

positively identified from available exposures; its possible absence could be related to post-stage 12 uplift. Aggradational episodes correlate with glaciations and loess deposition, whereas degradational episodes correlate with interglaciations or interstades and soil formation, implying that climate is the primary control on Quaternary paleohydrology. This in turn points to variations in the Earth's orbital geometry as the major factor that modulates both climate and, ultimately, the fluvial system in the Qinling Shan. In this region, glaciations were dominated by a cold, dry winter monsoon climate, whereas during interstades and interglaciations a warmer and wetter climate prevailed, implying strengthening of the summer monsoon. Both the loess/paleosol and the alluvial records are consistent with climate-model simulations spanning the last 18,000 yr that show a change from cold, dry conditions during the last glacial maximum to a climate warmer and wetter than present during the first half of the Holocene.

Location: AEU SCI QE 696 Q24
Area: China
Topics: Geomorphology - terraces, Loess, Loess - dating, Palaeosols, Stratigraphy, Tectonism, Climate history - China, Glacial history - China

Pye, K., and L. Zhou

1989 Late Pleistocene and Holocene Aeolian Dust Deposition in North China and the Northwest Pacific Ocean. Palaeogeography, Palaeoclimatology, Palaeoecology 73:11-23.

Rates of dust deposition in the North Pacific and the Central Loess Plateau of China show a poor correlation during the last 30,000 yr, although in both cases the dust was derived from deserts in northern China. Loess accumulation rates were high at the time of the last glacial maximum, while dust flux to the North Pacific was low at this time. Maximum dust flux to the North Pacific is recorded in the mid-Holocene, but Holocene rates of loess accumulation have been low. These differences are shown to reflect the different nature of the wind conditions responsible for dust transport to the Loess Plateau and the North Pacific. Dust transport responsible for formation of the loess occurred mainly in the lower 1.5 km of the atmosphere and was accomplished by cold, low-level northwesterly winds associated with cold waves emanating from the Mongolian anticyclone. At present such conditions occur quite frequently in winter but during the coldest phases of the Pleistocene they probably also occurred in the spring and summer. Long-range dust transport from northern China to the North Pacific requires that the dust is lifted to high levels (above 3 km) where it can be incorporated into the strong mid-latitude westerlies. Strong vertical motions of the atmosphere occur most frequently in the spring when the Mongolian anticyclone begins to weaken and frontal depressions move across the deserts of northern China. Such frontal depressions were probably more frequent during the climatic optimum of the mid-Holocene and during previous interglacials. Changes in continental aridity have probably played a minor role in controlling the magnitude of the dust flux to the North Pacific.

Location: AEU SCI QE 500 P15
Area: China - north-central
Topics: Loess, Palaeowinds, Climate history - China, Dating - TL

Ren Meie, Liu Zechun, Jin Jinluo, Deng Xiyang, Wang Feiyan, Peng Buzhuo, Wang Xueyu, and Wang Zonghan

1981 Evolution of Limestone Caves in Relation to the Life of Early Man at Zhoukoudian, Beijing. Scientia Sinica 24(6):843-851.

Peking man's cave, Zhoukoudian, Beijing, is a worldwide known site where fossils of Peking Man have been discovered. The cave is a vertical limestone cave, filled with cave deposits, more than 40 m thick. According to principles of development of limestone caves, comparison between cave deposits and sediments outside the cave, data of absolute dating, former records of excavation of Peking Man's cave and suggestions from colleagues, evolution of Peking Man's cave may be divided into 5 stages: stage of deep burial, stage when an East entrance was opened, stage when Peking Man mainly dwelled in eastern part of the cave, stage of the collapse of cave roof of Pigeon's Chamber and westward migration of Peking Man's habitat and stage when the cave was filled up and Peking Man left the cave.

Location: AEU SCI Q 1 S418
Area: China - northern
Topics: Archaeological sites - Zhoukoudian, Stratigraphy, Sedimentology

Rutter, N., Ding Zhongli, M. E. Evans, and Liu Tungsheng
1991 Baoji-Type Pedostratigraphic Section, Loess Plateau, North-Central China. Quaternary Science Reviews 10:1-22.

The Baoji section is judged to be the most complete pedostratigraphic section on the Loess Plateau of north-central China. It is located about 5 km north of the city of Baoji and consists of 37 paleosols formed during more than the last 2.5 Ma. It is designated here as the type pedostratigraphic section with formally named geosols following the rules of the North American Commission on Stratigraphic Nomenclature. Geochronological control is based largely on magnetostratigraphy with the Brunhes, Matuyama and Gauss epochs, and Jaramillo and Olduvai events clearly recognized. The Baoji geosols can be correlated with equivalent pedostratigraphic units throughout the Loess Plateau by a combination of magnetostratigraphy and character, position and the association of the pedostratigraphic units within the Quaternary succession. The variation of the geosols suggests climatic cycles of varying intensity and duration; but generally warmer and moister conditions when compared with the loess units that suggest colder and drier periods.

Location: AEU SCI QE 696 Q245
Area: China - north-central
Topics: Palaeosols, Loess, Palaeomagnetism, Climate history - China, Stratigraphy

Rutter, N., Ding Zongli, M. E. Evans, and Wang Yuchun
1990 Magnetostratigraphy of the Baoji Loess-Paleosol Section in the North-Central China Loess Plateau. Quaternary International 7/8:97-102.

The Baoji Section is judged to be the most complete, accessible Quaternary loess-paleosol section in the north-central China Loess Plateau; it is located 5 km north of the city of Baoji. It contains 37 paleosols and was recently named the type-pedostratigraphic section. The pedostratigraphic units (geosols) of the Baoji Section can be correlated throughout the Loess Plateau by a combination of magnetostratigraphy, and character, position and association of pedostratigraphic units. Magnetic properties were determined from 483 samples taken from 159 m of loess that overlies the Red Clay formation. All major reversals that occurred in the last 2.5 Ma were recorded. The Brunhes/Matuyama boundary occurs at a depth of 58.5 m within loess unit L_8, the Jaramillo Subchron between 72.0 m in loess unit L_{10} and 76.4 m in paleosol S_{11}, the Olduvai Subchron between 125.5 m in loess unit L_{25} and 131.5 m in loess unit L_{27}, and the Gauss/Matuyama boundary at 157.8 m within loess unit L_{33}, just above the contact with the Red Clay formation. This is the only known site where all major magnetic reversals are clearly defined in distance field identifiable loess-soil units in one section. The magnetostratigraphy of the Baoji Section is thus recommended as the type section for the Loess Plateau.

Location: AEU SCI QE 696 Q229
Area: China - north-central
Topics: Loess, Palaeosols, Palaeomagnetism

Shi, Y., B. Ren, J. Wang, and E. Derbyshire
1986 Quaternary Glaciation in China. Quaternary Science Reviews 5:503-507.

Notes: Special volume, *Quaternary Glaciations of the Northern Hemisphere*, edited by V. Sibrava, D. Q. Bowen, and G. M. Richmond. Report of IGCP Project 24.
Location: AEU SCI QE 696 Q245
Area: China
Topics: Glacial history - China, Stratigraphy, Geomorphology

Shi Yafeng, Xie Zichu, and Li Jijun

1990 Recent Progress of Glacial and Quaternary Glaciation Research in China. In *Recent Development of Geographical Science in China*, edited by Geographical Society of China, pp. 164-168. Science Press, Beijing, China.

Location: AEU SCI G 76.5 C45 R295
Area: China
Topics: Review of glacial history - China

Smalley, I. J., and B. Grabowska-Olszewska

1984 Loess Stratigraphy and Quaternary Chronology: Examples from China, Poland, New Zealand and England. In *Correlation of Quaternary Chronologies*, edited by W. C. Mahaney, pp. 339-357. Geobooks, Norwich, England.

In the twenty years from 1964 to 1984 loess stratigraphy has become a major method for studying Quaternary climatic changes. Two factors contributed to this great advance: 1) the recognition of multiple palaeosols in loess sections in China and Central Europe and 2) the development of new methods of analysis and dating. Palaeomagnetic methods have proved extremely useful; the Brunhes-Matuyama boundary occurs in long sections and provides a critical absolute date. It now appears to fall in palaeosol S8 in the Chinese loess - indicating eight identifiable loess depositional events since 730 000 BP. ...

A major aim of loess stratigraphy is to obtain correlation with the Quaternary climate record of the oceanic cores. Some good correlations are appearing and the comparison of the long loess sections with the oceanic record shows a similar succession of events. ...

Notes: Abstract shortened.
Location: AEU SCI QE 696 C82
Area: China
Topics: Loess, Stratigraphy, Palaeosols, Palaeomagnetism, Faunal remains, Pollen records, Dating - TL, Review of loess studies

Smalley, I. J., and D. H. Krinsley

1978 Loess Deposits Associated with Deserts. Catena 5:53-66.

The division of loess deposits into warm/desert and cold/glacial is well entrenched in the literature. The nature and distribution of glacial loess are well accounted for but doubts have been cast on the existence of a true desert loess, i.e. a loess consisting of silt particles actually formed in a desert region. It appears that the loess deposits in Central Asia and North China were formed from silt particles transported out of adjacent deserts - but the particles themselves had their origins in glacial grinding and cold weathering processes in the adjacent mountains. Thus the deserts close to mountainous areas tend to have associated loess deposits. Deserts which are not particularly associated with mountains, e.g. the Sahara and Australian deserts, do not have large loess deposits nearby. Some loess deposits in the Persian/Arabian Gulf region have been observed which consist of silt-sized carbonate particles; a separate division of carbonate loess is proposed. Large scale silt formation is still one of the consequences of glacial action, however it is apparent from recent studies of quartz clasts that glacial grinding is not such an exclusive quartz silt producer as was once proposed. Much coarse-silt-sized quartz is produced directly by weathering of igneous rocks, but there appears to be little doubt that the vast majority of the silt particles for the loess deposits of the world were formed as a consequence of glacial action and cold weathering - and this includes the deposits in Central Asia and North China.

Location: AEU SCI GB 400 C35
Area: China - north-central
Topics: Loess

Stoddart, D. R.

1978 Geomorphology in China. Progress in Physical Geography 2:187-236.

Location: AEU SCI G 1 P96
Area: China
Topics: Review of glacial history - China, Review of geomorphology - China, Loess

Sun Dianqing, and Wu Xihae

1986 Preliminary Study of Quaternary Tectono-Climatic Cycles in China. Quaternary Science Reviews 5:497-501.

The evolution of the natural environment by geological activity has been controlled mainly by tectonic movement and climatic changes. Through comprehensive studies on Quaternary glaciations and sequences, magnetostratigraphy, climatostratigraphy and others it has gradually been revealed that there was a periodical synchronized variation and development in respect of climatic change, erosion-deposition processes and tectonic movements. According to the studies of Quaternary geology in the Beijing area, Wu (1983) put forward a concept of a tectono-climatic cycle, about 3.4 Ma ago, and its subdivisions. This paper provisionally considers the main features of Quaternary tectono-climatic cycles in China.

Notes: Special volume, *Quaternary Glaciations of the Northern Hemisphere*, edited by V. Sibrava, D. Q. Bowen, and G. M. Richmond. Report of IGCP Project 24. References omitted from abstract. Introductory paragraph used as abstract.
Location: AEU SCI QE 696 Q245
Area: China
Topics: Tectonism, Glacial history - China, Loess

Wang Yun-sheng

1985 Preliminary Study of the Subdivision of the Nihewan Formation. In *Quaternary Geology and Environment of China*, edited by Liu Tung-sheng, p. 29. Quaternary Research Association of China, China Ocean Press, Beijing, China.

Notes: First published in China in 1982. Republished 1985 and distributed by Springer-Verlag, Berlin.
Location: AEU SCI QE 696 Q1197
Area: China - northern
Topics: Stratigraphy, Climate history - China

Wang Yong-yan, Teng Zhi-hong, and Yue Le-ping

1985 Microtextures of Loess and the Genesis of Loess in China. In *Quaternary Geology and Environment of China*, edited by Liu Tung-sheng, pp. 61-68. Quaternary Research Association of China, China Ocean Press, Beijing, China.

On the surface of the quartz grains of loess mechanical microtextures are often observed such as dish-shaped pits, grooves with rounded and smooth bottom, rounded edge angles, development of pited [sic] faces, etc. These surface microtextures resemble those of desert quartz grains, which shows that wind action is supposed to have played an important role during transportation of loess original materials. As for the chemical microtextures such as silica precipitates, chemical itching [sic] and dissolution phenomena on the surface of the precipitates, they might have been subjected to weathering in situ, especially in the process of pedogenesis. Pedogenesis must not be neglected in the process of formation of loess.

Sometimes broken fissures in quartz grains with sharp edges and angles may be observed which might have been formed by the freezing weathering during glacial period.

Supporting-spaced and mosaic-spaced contact are the essential relation between the coarse minerals of loess. They often coexist with each other and the mineral grains are accumulated disoderly [sic]. Such special microtextures of loess may be regarded as the result of eolian accumulation.

On the basis of the above mentioned microtextures of loess, it may be considered that the genesis of loess in China is comprehensive but the main genesis is eolian.

Notes: First published in China in 1982. Republished 1985 and distributed by Springer-Verlag, Berlin.
Location: AEU SCI QE 696 Q1197
Area: China - north-central
Topics: Loess, Sedimentology - loess

Wang Yong-yan, and Yue Le-ping

1985 Paleomagnetic Stratigraphy of Loess in China. In *Quaternary Geology and Environment of China*, edited by Liu Tung-sheng, p. 60. Quaternary Research Association of China, China Ocean Press, Beijing, China.

Notes: First published in China in 1982. Republished 1985 and distributed by Springer-Verlag, Berlin.
Location: AEU SCI QE 696 Q1197
Area: China
Topics: Loess - dating, Palaeosols, Palaeomagnetism

Wen Qi-zhong, Yang Wei-hua, Diao Gui-yi, Sun Fu-qing, Yu Su-hua, and Liu You-mei

1985 The Evolution of Chemical Elements in Loess of China and Paleoclimatic Conditions Durin [sic] Loess Deposition. In *Quaternary Geology and Environment of China*, edited by Liu Tung-sheng, pp. 74-82. Quaternary Research Association of China, China Ocean Press, Beijing, China.

Geochemical data of Luochuan Loess section have been analyzed by statistic method. The results indicate that the contents of elements of Al, Fe^{+++}, Mn, Ti, K decrease from bottom upward; whereas, the contents of Ca, Sr, Si and Fe^{++} show an opposite tendency. REE content in loess lies in the range of 160-210 ppm, and their distribution patterns in different loess samples show a similarity with each other. $CaCO_3$ and Sr in paleosols were strongly leached; whereas, Al_2O_3 and Fe_2O_3 show an obvious accumulation. Meanwhile, trace elements Mn, P, Zn, Cu, etc. and REE content also increase relatively in paleosols. The fluctuations of elements in 1st, 5th, 8th and 14th paleosols are especially evident, the boundaries of which are similar to those of sedimentary cycles or stratigraphic boundaries.

Periodicity in the evolution of chemical elements agrees well to those of insolation and isotopic oxygen changes in deep-sea sediments by analysis of autocorrelation coefficient and power spectrum $CaCO_3$ content, FeO/Fe_2O_3, $CaO+K_2O+Na_2O/Al_2O_3$ and Sr/Ba ratios well reflect climatic periods with the intervals of 80-100, 40-50, 20-30 thousand years, which demonstrates that the climatic variation was controlled by astronomical factors. Based on the established elemental periods loess sections are divided into sedimentary cycles and subcycles, providing important evidences for the division of climatic cycles since Quaternary.

Notes: First published in China in 1982. Republished 1985 and distributed by Springer-Verlag, Berlin.
Location: AEU SCI QE 696 Q1197
Area: China - north-central
Topics: Loess, Palaeosols, Climate history - China, Loess - geochemistry

Wilson, M. C.

1988 Preliminary Geoarchaeological Studies in Loess of the Lanzhou Area, Gansu Province, People's Republic of China. Current Research in the Pleistocene 5:100-101.

Location: AEA PMA/ASA
Area: China - north-central
Topics: Loess, Stratigraphy, Geoarchaeology

Wu Zi-rong, and Gao Fu-Qing

1985 The Formation of Loess in China. In *Quaternary Geology and Environment of China*, edited by Liu Tung-sheng, pp. 137-138. Quaternary Research Association of China, China Ocean Press, Beijing, China.

Notes: First published in China in 1982. Republished 1985 and distributed by Springer-Verlag, Berlin.

Location: AEU SCI QE 696 Q1197
Area: China - north-central
Topics: Loess, Palaeowinds, Climate history - China

Yang Huai-jen, and Chen Xi-qing

1987 Quaternary Transgressions, Eustatic Changes and Movements of Shorelines in North and East China. In *International Geomorphology 1986 Part II*, edited by V. Gardiner, pp. 807-827. John Wiley and Sons, New York, New York.

Hundreds of cores have been taken from the coastal plains of North and East China and studies of biostratigraphy, magnetostratigraphy and radiometric age determination reveal a close relation between climatic and sea-level changes. This paper deals with the complicated relationship between sea-level changes, buried marine horizons, neotectonics and evolution of the coastal plain. Foraminiferal faunas and sedimentary facies show eight to ten marine horizons at different depths in the Great Plain of North China. In the coastal plain of North China and the Gulf of Puhai six marine horizons have developed since the late Pleistocene and can be correlated with eustatic high stands of sea levels. In the early Pleistocene major neotectonic movements caused the sea to transgress far inland along fault bounded features. The time intervals between two successive late Pleistocene marine horizons are much shorter, possibly due to the increasing amplitude of sea level fluctuations linked to the Quaternary glacial cycles. Since the coastline of China spans different geotectonic units, the influence of tectonic movements varies greatly. Specific attention is paid to the regional Quaternary sea level fluctuations and dynamic stratigraphy. The factors that have controlled the development of cheniers and its implication in reconstructing the history of sea level changes are discussed together with a consideration of the rate of coastal progradation and the impact of sea-level fluctuation on the human activity since the mid-Holocene.

Location: AEU SCI GB 400.2 I614
Area: China - eastern
Topics: Sea level changes, Ocean cores, Palaeomagnetism, Tectonism

Yang Zunyi

1986 The Cainozoic. In *The Geology of China*, edited by Yang Zunyi, Cheng Yuqi and Wang Hongzhen, pp. 168-181. Oxford Monographs on Geology and Geophysics No. 3. Clarendon Press, Oxford.

Location: AEU SCI QE 294 Y22
Area: China
Topics: Stratigraphy, Glacial history - China, Faunal associations, Tectonism

Zhang Linyuan, Dai Xuerong, and Shi Zhengtao

1991 The Sources of Loess Material and the Formation of the Loess Plateau in China. Catena Supplement 20:1-14.

A large proportion of the Quaternary silt deposits in China are eolian in origin. Deposits in the area north of the Qinling Mountains and in the middle and lower Yangtze River valley originated in the deserts of northwestern China. The source area for the silt deposits on the eastern edge of the Tibet Plateau and in Sichuan Province is the interior of the Tibet Plateau. The principal area of deposition, the Loess Plateau, is partially enclosed by upland. This topography favours subaerial deposition. The Loess Plateau is still developing at the present time.

Notes: In *Loess: Geomorphological Hazards and Processes*, edited by S. Okuda, A. Rapp and Zhang Linyuan. Summary used as abstract.
Location: AEU SCI QE 579 L826
Area: China
Topics: Loess, Palaeowinds, Sedimentology - loess, Stratigraphy

Zhang, X., Z. An, T. Chen, G. Zhang, R. Arimoto, and B. J. Ray

1994 Late Quaternary Records of the Atmospheric Input of Eolian Dust to the Center of the Chinese Loess Plateau. Quaternary Research 41:35-43.

The concentrations of 15 elements and mineral grain-size distributions were determined for Late Quaternary loess sediments from the Chinese Loess Plateau. Particle-size distributions of the loess were approximately log-normal for each of three modes (i.e., 0.04 to 1 μm diameter, 2 to 20 μm, and 20 to 200 μm) that integrate the transport and deposition of eolian dust. The mass particle-size distributions of typical crustal elements (Si, Ca, Fe, Ti, K, Mn, and V) in paleosol and loess samples show patterns similar to those of mineral aerosols, but higher concentrations occur in the submicrometer sediment particles. Absolute principal component analysis of the elemental data suggests that the loess can be described in terms of synsedimentary and postdepositional concentration and subvertical migration of $CaCO_3$ and various elements through the deposit. A variety of geochemical indicators in the loess are apparently sensitive to Asian monsoon variations; these include the mass ratio of course to fine particles, the concentration ratios of certain trace elements, the elemental fluxes associated with eolian dust, and the bulk concentration of Ca in the sediments.

Location: AEU SCI QE 696 Q24
Area: China - north-central
Topics: Loess, Palaeosols

Zheng Hong-han

1985 Paleoclimate Events Recorded in Clay Minerals in Loess of China. In *Quaternary Geology and Environment of China*, edited by Liu Tung-sheng, pp. 83-92. Quaternary Research Association of China, China Ocean Press, Beijing, China.

86 samples of loess and paleosol for study on clay mineral were taken from Heimugou Loess section at Luochuan and Nuanquangou Loess section at Longxi. The results indicate that the loess and paleosol of different ages show a close similarity in their clay mineral species with the illite as the dominant component, and they also contain more or less certain amounts of chlorite, kaolinite, montmorillonite, vermiculite, halloysite and a detectable amount of mixed-layer minerals.

Some indicators, the ratio of the illite (001) reflexion [sic] peak height and width at half height (H/W value) and the ratio of (001) and (002) reflexion [sic] intensities (I(001)/I(002) are adopted to discuss the loess variation in the clay mineral crystallinity after pedogenesis.

The relative amount of clay mineral species and their crystallinity are adopted as indicators showing the climate fluctuation amplitude, and the time scale was controlled by data of biostrata, magnetostrata, radiocarbon and thermoluminescence dates. 13 climatic cycles with 26 stages have been distinguished in loess sections since loess deposition. An attempt to correlate climatic events recorded in loess sections of China with glacial/interglacial in Northern Europe and the isotope oxygen stages in deep sea sediments is presented in this paper.

Notes: First published in China in 1982. Republished 1985 and distributed by Springer-Verlag, Berlin.
Location: AEU SCI QE 696 Q1197
Area: China - north-central
Topics: Loess - clay mineralogy, Stratigraphy, Climate history - China

Zhou Mu-lin

1985 A Review of Studies on the Quaternary Glacial and Interglacial Sequences in China. In *Quaternary Geology and Environment of China*, edited by Liu Tung-sheng, p. 28. Quaternary Research Association of China, China Ocean Press, Beijing, China.

Notes: First published in China in 1982. Republished 1985 and distributed by Springer-Verlag, Berlin.
Location: AEU SCI QE 696 Q1197
Area: China
Topics: Glacial history - China

Zhou Youwu, Qiu Guoqing, and Guo Dongxin
1991 Quaternary Permafrost in China. Quaternary Science Reviews 10:511-517.

Location: AEU SCI QE 696 Q245
Area: China
Topics: Review of permafrost - China, Climate history - China, Periglacial features

PART 3. LATE QUATERNARY PALAEOENVIRONMENTS

Chen Cheng-hui, Lu Yen-chou, and Shen Cheng-teh

1978 Development of Natural Environment in the Southern Part of Liaoning Province During the Last 10,000 Years. Scientia Sinica 21(4):516-532.

According to analyses of sedimentation sequence, sporo-pollen assemblage, and radiocarbon datings of the Holocene deposits in southern Liaoning, a preliminary geological time scale for the Holocene has been established and a general development of the natural environments during the last 10,000 years has been given. The Holocene can be subdivided into three stages: the Pulantien period of the Early Holocene (about 10,000-8,000 years B. P.), the Takushan period of the Middle Holocene (about 8,000-2,500 years B. P.), and the Chuangho period of the Late Holocene (about 2,500 years B. P.). The history of climatic fluctuation, vegetation alternation, and shoreline changes indicates that the early Takushan period (about 8,000-5,000 years B. P.) was the warmest and wettest climatic optimum and the high sea-level during the last 10,000 years.

Location: AEU SCI Q 1 S418
Area: China - northeastern
Topics: Climate history - China, Stratigraphy, Sea level changes, Vegetation history - China, Pollen analysis - China, Plant macrofossils - seeds, Molluscs - marine, Plant macrofossils - wood, Plant macrofossils - peat

Chen Fangji

1980 Holocene of Beijing Region and the Changes of its Natural Environments. Scientia Sinica 23(5):621-633.

The present article is written on the basis of drill holes data and samples of spores and pollen as well as other microfossils. Geological dating of beds by means of radioactive carbon was carried out. A Holocene time-scale is established preliminarily for the Beijing region and the basic outline of the natural environmental changes of the Beijing plain in the past ten thousand years has been restored. The Holocene here may be divided as follows: (i) Paleo-Holocene Changgou Formation (about 12,000-8,000 years B. P.), (ii) Early-Holocene Yinjiabe Formation (about 8,000-6,000 years B. P.), (iii) Mid-Holocene Yingezhuang Formation (about 6,000-2,200 years B. P.), and (iv) Late-Holocene Liubintun Formation (2,000 years B. P. to the present).

Location: AEU SCI Q 1 S418
Area: China - northern
Topics: Stratigraphy, Pollen analysis - China, Ostracodes, Plant macrofossils, Plant macrofossils - peat, Climate history - China, Sea level changes, Faunal remains - China, Dating - analysis of radiocarbon dates

Cui Zhijiu, and Xie Youyu

1985 On the Southern Boundary of Permafrost and Periglacial Environment During the Late Period of Late Pleistocene in North and Northeast China. Abstracts of Chinese Geological Literature 1(1/2):70-71. The National Geological Library of the PRC, Beijing, China.

Area: China - northeastern
Topics: Sea level changes, Climate history - China, Faunal remains - *Coelodonta antiquitatis*, Faunal remains - *Mammuthus*, Vegetation history - China, Periglacial features - ice wedges

Fang, J.

1991 Lake Evolution During the Past 30,000 Years in China, and its Implications for Environmental Change. Quaternary Research 36:37-60.

Throughout China over the last 30,000 years high lake levels were reached during 30,000-24,000, 22,500-20,000, and 9500-3500 yr B.P. Lake recovery after the last glacial maximum (LGM) apparently was much slower, and involved stronger regional differences, than was lake regression during the onset of the last glaciation. According to the character of lake development during the last 18,000 years, three regions and six subregions have been distinguished. In the Tibetan

Plateau and alpine regions of western China the plentiful supply of meltwater may have caused lakes to recover and reach their highest levels just after the LGM. Lake hydrology in central and northern China was directly controlled by rainfall and evaporation, and most lakes reached their highest levels between 9500 and 3500 yr B.P. In the lowlands of eastern China lake recovery was closely tied with channel aggradation and water level rise of rivers, which are associated with Holocene sea level rise and human agricultural activities. Most lakes recovered and were most extensive in the middle and late Holocene.

Location: AEU SCI QE 696 Q24
Area: China
Topics: Lake level changes, Ostracodes, Molluscs, Diatoms, Sea level changes, Pollen records - China, Climate history - China, Vegetation history - China

Jiang Peng

1987 Living Environment of Late Paleolithic Man in Northeast China. Current Research in the Pleistocene 4:14-16.

Location: AEA PMA/ASA
Area: China - northeastern
Topics: Archaeological sites - Yanjiagang, Archaeological sites - China - northeastern, Climate history - China, Vegetation history - China, Pollen analysis - China, Periglacial features, Faunal associations, Faunal remains - *Mammuthus primigenius*, Faunal remains - *Coelodonta antiquitatis*, Faunal remains - *Equus przewalskii*, Faunal remains - *Crocuta ultima*, Faunal remains - *Bison exiguus*

Kong Zhao-chen, and Du Nai-qiu

1985 The Climate in Sanjiang Plain During the Past 36000 Years. In *Quaternary Geology and Environment of China*, edited by Liu Tung-sheng, p. 233. Quaternary Research Association of China, China Ocean Press, Beijing, China.

This paper is based on the macrofossil plants of *Larix gmelini* Rupr. and *L. olgensis* Henry and abundant pollen, spores, and green algae of 2 peat samlpes [sic] obtained from digging a irrigating canal at Jiansanjing farm (6.5 m and 3.5m deep below the surface) in Sanjiang plain. About 36,000 years ago Sanjiang Plain was covered by cryophilic needleleaf deciduous forest, prodominant [sic] of *Larix* spp., *Betula*, herb and green algae. The climate of Sanjiang Plain was rather humid and cold, with an annual mean precipitation higher than that of the present. The lakes and bogs were well developed. According to the information of macrofossil and palynoflora, we hold that in the late-glacial, *Larix*, *Abies*, *Picea*, *Betula* forests became predominant in the Sanjiang plain. Therefore, the development of swamp in Sanjiang Plain has been rapid since Late Pleistocene.

Notes: First published in China in 1982. Republished 1985 and distributed by Springer-Verlag, Berlin.
Location: AEU SCI QE 696 Q1197
Area: China - northeastern
Topics: Climate history - China, Plant macrofossils - *Larix*, Vegetation history - China, Pollen analysis - China

Kong Zhaochen, and Du Naiqiu

1991 Dramatic Changes of Vegetation and Climate in North China Since the Late Pleistocene. In *INQUA, 13th International Congress, Beijing, China, Abstracts*, p. 171.

Area: China - northern
Topics: Vegetation history - China, Pollen records - China, Climate history - China

Li Handing, and Gao Fengqi

1991 Time Regulation of Peat Development and Peat-Form Period Since Later Stage of Epipleistocene in the East of China. In *INQUA, 13th International Congress, Beijing, China, Abstracts*, p. 193.

Area: China - eastern
Topics: Plant macrofossils - peat, Climate history - China, Glacial history - China

Li Rongquan

1991 Change of Environment and Periglacia in North China. In *INQUA, 13th International Congress, Beijing, China, Abstracts*, p. 198.

Area: China - northern
Topics: Climate history - China

Li Wen-yi

1984 Pleistocene Vegetation and Environment in East Hebei Plain, North China. In *6th International Palynological Conference, Calgary, Abstracts*, p. 91.

Area: China - northern
Topics: Pollen analysis - China, Climate history - China, Vegetation history - China

Liu, K.

1986 The Pleistocene Changes of Vegetation and Climate in China. In *AMQUA, 9th Biennial Meeting, Champaign, Illinois, Program and Abstracts*, p. 94.

Location: AEU HSS QE 696 A5212
Area: China
Topics: Review of pollen analyses - China, Pollen records - China, Plant macrofossils, Climate history - China, Vegetation history - China

1988 Quaternary History of the Temperate Forests of China. Quaternary Science Reviews 7:1-20.

Pollen data from 80 sites in North China and Northeast China are reviewed to document the Quaternary history of the deciduous forest and the temperate mixed conifer-hardwood forest of China. During the Late Tertiary the forest in North China consisted of an admixture of temperate deciduous hardwoods, subtropical broadleaved evergreen elements, and ancient conifers of tropical and subtropical affinities. Pollen evidence from long boreholes through Quaternary deposits indicates four or five glacial/interglacial climatic cycles. The first glacial episode, known as the Nangou Cold Period, led to the development of a spruce-fir forest of no modern analogue in North China. Deciduous forest was re-established in North China during the intervening interglacials. The subtropical evergreen elements and Tertiary relicts were successively eliminated during the subsequent glacials. In the last glacial, spruce-fir forests which are now confined to mountain slopes above 1500 m descended to the lowlands of North and Northeast China, implying a temperature depression of at least 8-10°C. Cold steppe occurred at least locally near Beijing in the last glacial maximum, but the data base is insufficient to delimit the spatial and temporal extent of this and other paleovegetation types on a regional scale, or to reconstruct the locations of glacial refugia and the dynamics of plant migration. The Holocene pollen stratigraphies suggest a tripartite division, with a period of maximum warmth, the Hypsithermal, in the mid-Holocene. In both North and Northeast China, the forest became more diverse during the mid-Holocene when thermophilous hardwoods expanded at the expense of pine and, in more southerly locations, birch. Unequivocal evidence for intensified summer monsoon during the early Holocene, as predicted by the Kutzbach model based on orbital parameter changes, remains to be found from the pollen records of the temperate forest regions of China.

Location: AEU SCI QE 696 Q245
Area: China - northern, China - northeastern
Topics: Review of vegetation history - China - northern, Review of pollen studies - China - northern, Sea level changes, Pollen records - China, Plant macrofossils - wood

Liu Min-hou

1985 Fossil Soil Layer in Pleistocene Sediment of Huanghai Sea. In *Quaternary Geology and Environment of China*, edited by Liu Tung-sheng, pp. 195-199. Quaternary Research Association of China, China Ocean Press, Beijing, China.

The preliminary physico-chemical analyses of so called "hard mud layer" or "hard clay layer" in cores of Late Pleistocene in Huanghai Sea (Yellow Sea) indicate that they actually represent buried fossil layers in three different periods. Their common characteristic is that none of them has formed inherent stratified units of typical fossil soil section, but only stopped at the early period of soil development, similar with buried weathering layer in loess. But according to the analysis of organic materials there exists another possibility, i.e. owing to the later transgression, the most part of the well developed fossil soil layer at that time had been washed away, and only the relict part of its parent material layer left there.

Notes: First published in China in 1982. Republished 1985 and distributed by Springer-Verlag, Berlin.
Location: AEU SCI QE 696 Q1197
Area: China - eastern
Topics: Clay mineralogy, Palaeosols, Ocean cores, Sea level changes, Pollen records - China, Climate history - China

Luo Baoxin, Wang Yuzhao, and Hu Jilan

1980 A Sketch of Quaternary Palynology in China. In *5th International Palynological Conference, Cambridge, England, Abstracts*, p. 237.

Area: China
Topics: Climate history - China, Pollen records - China

Sun Jianzhong, and Li Xingguo

1987 Palaeo-environment of the Last Glacial (Dali) Stage in North China. In *International Geomorphology 1986 Part II*, edited by V. Gardiner, pp. 763-773. John Wiley and Sons, New York, New York.

Limited glacial ice was present in the Taibaishan and Baitoushan Mountains. In the northern area of North China, periglacial environments were dominant during the last glacial (Dali) stage, while cool climatic conditions prevailed in the south. The indicators of the cold climate include: permafrost, periglacial structures and cold faunas and floras. On the basis of pollen analysis and data from ^{14}C and U-series dating, the glacial stage can be subdivided into three substages, Early Dali (70,000-53,000 yr B.P.) with a desert or steppe environment (mean annual temperature about 10° lower than present); Middle Dali (53,000-23,000 yr B.P.) including the Liufangtun Interstadial (53,000-36,000 yr B.P.), Ashihe Stadial (36,000-32,000 yr B.P.) and Shangetun Interstadial (32,000-23,000 yr B.P.)(mean annual temperatures 4°C respectively lower than present) and Late Dali consisting of Beizhuangcun Stadial (23,000 13,000 yr B.P.) and Fengzhuang Interstadial (13,000 - 11,500 yr B.P.). The Beizhuangcun Stadial, the coldest in the Dali Stage, (mean annual temperature 12°C lower than present). The southern limit of permafrost has oscillated between 38°-49°N latitude, and the coastline has moved across the continental shelf.

Location: AEU SCI GB 400.2 I614
Area: China - northeastern, China - northern
Topics: Climate history - China, Periglacial features, Geomorphology, Faunal associations, Plant macrofossils, Vegetation history - China, Pollen records - China, Faunal remains - China, Faunal remains - *Mammuthus*, Faunal remains - *Coelodonta antiquitatis*, Faunal remains - *Bison exiguus*, Faunal remains - *Bubalus wansjocki*, Sea level changes

Sun Xiangjun, and Chen Yinshuo

1991 Palynological Records of the Last 11,000 Years in China. Quaternary Science Reviews 10:537-544.

Location: AEU SCI QE 696 Q245

Area: China
Topics: Pollen records - China, Review of pollen analyses - China, Review of vegetation history - China

Tang Ling-Yu, and Huang Bao-Ren

1985 Quaternary Sporo-pollen and Ostracod Assemblages from the Continental Sediments in North China. In *Quaternary Geology and Environment of China*, edited by Liu Tung-sheng, pp. 155-159. Quaternary Research Association of China, China Ocean Press, Beijing, China.

This paper deals with the continental Quaternary sporo-pollen and ostracod assemblages from Beijing, Yangyuan Basin in Hebei, Datong Basin in Shanxi, Lantian in Shaanxi, Sanmenxia in Henan and Qinghai Lake area and Gonge Basin in Qinghai of China, and the relevant vegetation and climate are also discussed.

Notes: First published in China in 1982. Republished 1985 and distributed by Springer-Verlag, Berlin.
Location: AEU SCI QE 696 Q1197
Area: China - northern, China - eastern, China - north-central
Topics: Pollen records - China, Ostracodes, Climate history - China, Vegetation history - China

Wang Pinxian

1984 Progress in Late Cenozoic Palaeoclimatology of China: A Brief Review. In *The Evolution of the East Asian Environment, Volume I, Geology and Palaeoclimatology*, edited by R. O. Whyte, pp. 165-187. Centre of Asian Studies, University of Hong Kong, Hong Kong.

Area: China
Topics: Dendrochronology, Tectonism, Review of climate history - China, Glacial history - China, Faunal remains - China, Loess, Sea level changes

Wang Qiang, Shao Ya-jun, and Zhao Shi-de

1985 The Ostracoda Fauna of Late Quaternary and Paleoenvironment from Shalawusu (Sjara Osso-Gol) River District, Inner Mongolia Autonomous Region. In *Quaternary Geology and Environment of China*, edited by Liu Tung-sheng, p. 164. Quaternary Research Association of China, China Ocean Press, Beijing, China.

Notes: First published in China in 1982. Republished 1985 and distributed by Springer-Verlag, Berlin.
Location: AEU SCI QE 696 Q1197
Area: China - northern
Topics: Ostracodes

Wang Xianzeng

1984 The Palaeoenvironment of China from the Tertiary. In *The Evolution of the East Asian Environment, Volume I, Geology and Palaeoclimatology*, edited by R. O. Whyte, pp. 472-482. Center of Asian Studies, University of Hong Kong, Hong Kong.

Area: China
Topics: Tectonism, Climate history - China, Vegetation history - China

Xu Ren

1984 Changes of the Vegetation in China Since the Late Tertiary. In *The Evolution of the East Asian Environment, Volume II, Palaeobotany, Palaeozoology and Palaeoanthropology*, edited by R. O. Whyte, pp. 426-432. Centre of Asian Studies, University of Hong Kong, Hong Kong.

Area: China
Topics: Review of vegetation history - China, Pollen records - China

Zhang Lansheng

1984 Reconstruction of the Climate of the Late Pleistocene Ice Age in East China. In *The Evolution of the East Asian Environment, Volume I, Geology and Palaeoclimatology*, edited by R. O. Whyte, pp. 252-270. Centre of Asian Studies, University of Hong Kong, Hong Kong.

Work in the fields of glaciology, oceanography, palynology and Quaternary geology in recent decades has proved that in east China, as in other parts of the world, there were great climatic fluctuations in the Pleistocene - the alternation between glaciations and interglaciations. From the accumulation of data it is now possible to reconstruct the Late Pleistocene climate quantitatively. This paper is a preliminary attempt to reconstruct the palaeotemperature and precipitation in east China during the full Late Glaciation. The palaeoclimatic indicators used here include: periglacial phenomena, results of pollen analyses, variation in the altitude of tree lines, etc.

Notes: Abstract taken from introduction.
Area: China - eastern
Topics: Permafrost, Climate history - China, Sea level changes, Periglacial features - fossil ice wedges, Loess, Pollen records - China, Vegetation history - China, Treeline fluctuations - alpine, Treeline fluctuations - boreal forest, Climate reconstruction

Zhao Song-ling, and Chin Yun-shan

1985 Transgressions and Sea-Level Changes in the Eastern Coastal Region of China the Last 300,000 Years. In *Quaternary Geology and Environment of China*, edited by Liu Tung-sheng, pp. 200-209. Quaternary Research Association of China, China Ocean Press, Beijing, China.

Three marine transgressions invaded the western coast of Bohai Gulf in the last 100,000 years while the western coast of the Huanghai (Yellow) Sea was subjected to 5 marine transgressions in the last 300,000 years.

Notes: First published in China in 1982. Republished 1985 and distributed by Springer-Verlag, Berlin.
Location: AEU SCI QE 696 Q1197
Area: China - eastern
Topics: Sea level changes, Ocean cores, Stratigraphy, Foraminifera, Plant macrofossils - peat, Ostracodes, Molluscs

Zhou Kun-shu, and Hu Ji-lan

1985 The Paleoenvironment of the Shuidonggou Site of Ancient Cultural Remains in Lingwu County, Ningxia. In *Quaternary Geology and Environment of China*, edited by Liu Tung-sheng, p. 185. Quaternary Research Association of China, China Ocean Press, Beijing, China.

Notes: First published in China in 1982. Republished 1985 and distributed by Springer-Verlag, Berlin.
Location: AEU SCI QE 696 Q1197
Area: China - northern
Topics: Archaeological sites - China, Geoarchaeology, Lithics, Faunal remains - China, Pollen analysis - China

Zhun Kun-shu, Liany Xiu-long, and Liu Rui-ling

1980 A Preliminary Study of Palynology Since the Late Pleistocene in North China. In *5th International Palynological Conference, Cambridge, England, Abstracts*, p. 451.

Area: China - northern
Topics: Pollen records - China, Human/hominid remains, Vegetation history - China, Climate history - China

PART 4. LATE QUATERNARY PALAEONTOLOGY

Chang Chih-kuo

1964 Pleistocene Mammalian Fossils from Wangching, Kirin Province. Vertebrata PalAsiatica 8(4):402–413.

Location: AEU SCI QE 701 K95
Area: China - northeastern
Topics: Faunal remains - *Mammuthus primigenius*, Faunal remains - *Coelodonta antiquitatis*, Faunal remains - *Bos primigenius*
Language: Chinese with English summary on p. 407.

Chi Hung-xiang

1974 Late Pleistocene Mammals from Lantian, Shensi. Vertebrata PalAsiatica 12(3):222-227.

The present paper deals with a collection of mammalian fossils found *in situ* by a field team of IVPP in the late Pleistocene sandy clays interbeding [sic] with sands and gravels along the Laochihegou valley in Houzhen Commune, Lantian District, Shensi. ...

The ... list shows that the mammalian fauna is definitely one of late Pleistocene stage. All the mammalian species described in this paper are known forms. They belong to the same fauna as that found in Sjaraosso-gol and other late Pleistocene localities of North China. The mammalian fauna indicates the physical geographical condition of the Laochihegou area was predominant of animals of woodland and forests, but climatically being warmer and moist.

Notes: Abstract taken from summary. Two plates and caption page follow p. 227.
Area: China - northern
Topics: Faunal remains - *Microtus brandtoides*, Faunal remains - *Cricetulus varians*, Faunal remains - *Canis lupus*, Faunal remains - *Vulpes*, Faunal remains - *Crocuta ultima*, Faunal remains - *Panthera tigris*, Faunal remains - *Equus hemionus*, Faunal remains - *Equus przewalskii*, Faunal remains - *Coelodonta antiquitatis*, Faunal remains - *Moschus*, Faunal remains - *Pseudaxis hortulorum*, Faunal remains - *Megaloceros ordosianus*, Faunal remains - *Hydropotes*, Faunal remains - *Capreolus manchuricus*, Faunal remains - birds, Faunal associations
Language: Chinese with English summary on p. 227.

Chow Benshun

1978 The Distribution of the Woolly Rhinoceros and Woolly Mammoth. Vertebrata PalAsiatica 16(1):47–59.

The present paper reviews the geographic distribution of the Pleistocene woolly rhinoceros, *Coelodonta antiquitatis* Blumenbach and woolly mammoth, *Mammuthus primigenius* Blumenbach in the northern part of the Holarctic region with new data on their ranges in China.

The woolly rhinoceros, the wide-spread Palaeartic [sic] species ranged from 72°N to 33°N latitude, with a southern limite [sic] of about 36°N in the Late Pleistocene. The woolly mammoth, the Holarctic species ranged from 75°N to 39°N latitude, but moved southwards to 39°-40°N during the Late Pleistocene. Their presence in the more southern temperate zone of Eurasia and North America, represents probably the last wave of the immigrations of the boreal *Mammuthus-Coelodonta* Fauna from north to south during the Late Pleistocene corresponding to a phase of the Würm-Dali-Wisconsin glaciation.

The relationship between the geographic distribution of the Late Pleistocene *Mammuthus-Coelodonta* Fauna and the extension of the glacial and loessic deposits over the northern hemisphere is also discussed. ...

The present paper reviews the ranges of morphological changes within the genus *Coelodonta*, and proposes two new specific names.

Notes: Abstract shortened.
Area: China

Topics: Faunal remains - *Coelodonta antiquitatis*, Faunal remains - *Mammuthus primigenius*, Zoogeography - *Coelodonta antiquitatis*, Zoogeography - *Mammuthus primigenius*, Palaeontological sites - China, Faunal associations, Faunal migration
Language: Chinese with English abstract on p. 59.

Chow Minchen, and Hsieh Hsiang-hsu

1958 Some Pleistocene Mammalian Fossils from Chienping and Kongping, Liaoning. Acta Palaeontologica Sinica 6(1):51-57.

The few mammalian fossils from the Upper Pleistocene deposits of Chienping and Kongping of Liaoning province, briefly described in this paper were sent to the Institute of Vertebrate Palaeontology for study in early 1957 through the courtesy of the Provincial Cultural Bureau of Liaoning. Although no data regarding the exact localities and stratigraphical occurrences of these fossils are available and the specimens are for the most part very fragmentary, it is palaeontologically quite interesting because there are remains of Pleistocene mammals in the collection which either are of very rare occurrence (such as *Spirocerus* and *Ovis ammon*) or so far has never been recorded from the Pleistocene deposits of the Manchurian region.

Notes: Introductory paragraph used as abstract. One plate and caption page follows p. 57.
Area: China - northeastern
Topics: Faunal remains - *Equus*, Faunal remains - *Equus hemionus*, Faunal remains - *Coelodonta*, Faunal remains - *Spirocerus*, Faunal remains - *Ovis ammon*, Faunal remains - *Mammuthus primigenius*, Faunal remains - *Elaphurus menziesianus*
Language: Chinese with English translation on pp. 54-57.

Dong Wei, and Jiang Peng

1993 The Late Pleistocene Cervoidea (Arctodactyla) from Xianren Cave, Ji'an, Jilin. Vertebrata PalAsiatica 31(2):117-131.

The deer found in Xianren Cave at Ji'an, Jilin Province are of species of four sizes. The young individuals number nearly half of the total, and the aged individuals among adults are numerous. There is no prehistory human trace found in the cave. So they are very likely the remains left by the cave dwelling predators.

Moschus moschiferus at Ji'an is the first identified Pleistocene musk deer species in northeast China and its distribution is further north than formally [sic] reported. *Cervus (Sika) nippon hortulorum* is also the first identified Pleistocene sikine species in the region. The other two species are well known in the area. All of them are members of Late Pleistocene *Mammuthus-Coelodonta* fauna. *Megaloceros* is extinct at the end of the Pleistocene due to very likely climatic changes (e.g. the end of glaciation). The Specimens [sic] found in the cave also offer a good subject for studying the evolutionary lineages between fossil and living deer.

Notes: Conclusion used as abstract. One plate and caption page follows p. 131.
Area: China - northeastern
Topics: Palaeontological sites - China - northeastern, Faunal remains - *Moschus moschiferus*, Faunal remains - *Cervus nippon hortulorum*, Faunal remains - *Pseudaxis nippon hortulorum*, Faunal remains - *Megaloceros ordosianus*, Faunal remains - *Capreolus manchuricus*, Faunal associations, Zoogeography - deer
Language: Chinese with English summary and conclusion on pp. 129-130.

Han Defen, and Xu Chunhua

1985 Pleistocene Mammalian Faunas of China. In *Palaeoanthropology and Palaeolithic Archaeology in the People's Republic of China*, edited by Wu Rukang and J. W. Olsen, pp. 267-289. Academic Press, Orlando, Florida.

Notes: Contains extensive faunal lists organized geographically and chronologically.
Location: AEU HSS GN 772.32 C6 P17

Area: China
Topics: Palaeontological sites - China, Faunal remains - China, Archaeological sites - China, Archaeological sites - Zhoukoudian, Faunal associations

Huang Wanpo
1985 Quaternary Mammalian Faunas and Climatic Variations in Eastern China. Current Research in the Pleistocene 2:99-102.

Location: AEU HSS E 61 C97
Area: China - eastern
Topics: Faunal migration, Climate history - China, Faunal associations
Language: English (p. 99) with Chinese translation on pp. 101-102.

Huang Wanpo, Tang Yingjun, Ji Hongxiang, and Qi Guoqin
1991 The Present Status of Quaternary Mammals Studies in China. In *INQUA, 13th International Congress, Beijing, China, Abstracts*, p. 142.

Area: China
Topics: Faunal associations, Faunal remains - *Myospalax armandi*, Faunal remains - *Crocuta ultima*, Faunal remains - *Mammuthus*, Faunal remains - *Elephas maximus*, Faunal remains - *Equus hemionus*, Faunal remains - *Coelodonta antiquitatis*, Faunal remains - *Megaloceros ordosianus*, Faunal remains - *Bos primigenius*

Jernakov, V. N., and V. V. Ponosov
1958 Discovery of a Fossil Rhinoceros in Panlachengtze Near Harbin. Vertebrata PalAsiatica 2(4):269–275.

In July 1957, a farmer who lives in Panlachengtze, the southwestern suburb of Harbin, discovered several bones of a fossil animal. An excavation gave considerable material in the form of a large number of separate bones of a fossil rhinoceros, the description of which is the subject of this article.

Notes: Abstract modified.
Location: AEU SCI QE 701 K95
Area: China - northeastern
Topics: Faunal remains - *Rhinoceros tichorhinus*, Faunal remains - *Coelodonta antiquitatis*, Bone modification, Faunal remains - *Marmota sibirica*, Stratigraphy, Molluscs

Jiang Peng
1991 Discovery of a Comparatively Complete Skeleton of *Coelodonta* in Fuyu, Jilin. Acta Anthropologica Sinica 10(1):78-83.

A comparatively complete skeleton of *Coelodonta* was found in 1989 at Xiaoyaotun which lies 3 km to the north of Fuyu town, situated in the eastern part of Song Nen Plain. The skeleton of *Coelodonta* was unearthed from the second terrace of Songhua River, 140 m above the sea level. The stratigraphic section of the terrace from top to bottom is divided into six layers. The fossil was buried in greyish white silty sands of the fourth layer with a depth of 6.6 m under the surface. The mineralization degree of the specimen is not good because of the strong percolating of the sand layers.

The skeleton is basically intact, except the absence of left humerus, left radius, left ulna, some of vertebrate [sic] and phalangeal bones. The calculation based on the measurement of the bones suggests that the skeleton is 1.79 m high and 3.53 m long.

Based on the eruption and attrition of the teeth, we are of opinion that this animal died just after it became an adult individual. Judged from the nasal septum and features of its forehead, it was a female individual.

According to the stratigraphy of fossil-bearing sediments and *C. antiquitatis*' morphology, the animal might live in Late Pleistocene. Although a large number of *Coelodonta* skeletons, including skull, limb and teeth have been found in Jilin, such complete one had never been seen before and is rare in the whole country too. This discovery, therefore, provides a valuable evidence for studying the complete figures of *Coelodonta* and its living environment.

Notes: Summary used as abstract. One plate follows p. 83.
Area: China - northeastern
Topics: Faunal remains - *Coelodonta antiquitatis*, Stratigraphy
Language: Chinese with English summary on p. 83.

Jin Changzhu, Xu Qinqi, and Li Chuntian

1984 The Quaternary Mammalian Faunas from Qingshantou Site, Jilin Province. Vertebrata PalAsiatica 22(4):314-323.

In 1981 and 1983, mammalian remains associated with Paleolithic human fossils, Early Neolithic human skulls and cultural remains were collected from the Qingshantou site, located at the northern bank of the Chaganpao Lake in the Qianguo County, Jilin Province (124°18'30"E and 45°17'13"N).

In the region, there are many lakes and the largest one is the Chaganpao Lake, round which there are two terraces. The first terrace is consisted [sic] of new alluvions [sic]. The second terrace, from which the mammalian remains came is about 33 m above the shoreline of the lake (i.e. the average line of high levels). The sediments of the terrace consists of black soil and calcareous fine silt and sand. Deposits of the terrace can be subdivided into six layers.

The second and third layers in the geological section are fossiliferous ones. The mammalian remains recovered from Layer 2 are different from those of Layer 3 in the degree of fossilization and the percentage of the extant species.

Based on these differences two mammalian faunas, i.e. the Qianguo fauna and Qingshantou fauna, can be recognized. *Equus przewalskyi*, *Coelodonta antiquitatis*, *Bison* are generally considered important elements of the Mammathus [sic] - Coelodonta [sic] fauna. So the Qingshantou fauna belongs to the Mammathus [sic] - Coelodonta [sic] fauna too. The percentage of the extinct species in the Qingshantou fauna is less than those of the other Late Pleistocene faunas, such as the Yushu fauna (40000 years B. P.) and the Yianjiagang fauna (2000 [sic] years B.P.). The C^{14} date of the Qingshantou fauna is about 10900 years B.P., younger than that of the Yushu fauna and the Yianjiagang fauna.

The Qingshantou fauna differs from the typical Mammathus [sic] - Coelodonta [sic] fauna, such as the Yianjiagang fauna in Heilongjiang Province and the Yushu fauna in Jilin Province. There existed a large numbers [sic] of dry-prairie rodents, such as *Allactaga sibrica* [sic] *annulatas*, *Marmata* [sic] *bobac* etc. They account for 46% in the whole fauna. The ratio of prairie animals to those of forest ones in the Qingshantou fauna is 69:23. While in the Yushu fauna the ratio is 35:35. So during the Qingshantou fauna's time the climate was drier and colder than that in the other Late Pleistocene faunas' time.

Notes: Abstract taken from summary. One plate follows p. 323.
Area: China - northeastern
Topics: Archaeological sites - China - northeastern, Geoarchaeology, Faunal associations, Faunal remains - *Marmota bobak*, Faunal remains - *Citellus dauricus*, Faunal remains - *Microtus brandti*, Faunal remains - *Myospalax armandi*, Faunal remains - *Myospalax psilurus*, Faunal remains - *Allactaga sibirica*, Faunal remains - *Nyctereutes procyonoides*, Faunal remains - *Vulpes corsac*, Faunal remains - *Equus przewalskii*, Faunal remains - *Coelodonta antiquitatis*, Faunal remains - *Sus scrofa*, Faunal remains - *Bison*, Faunal remains - *Cervus*, Faunal remains - *Lepus tolai*, Faunal associations
Language: Chinese with English summary on pp. 322-323.

Li Rong

1991 On the Significance of the Newly-Found Skeletons in Inner Mongolia of Mammuthus sungari [sic] and Coelodonta antiquitatis [sic] in the Study of the Quaternary Period of China. In *INQUA, 13th International Congress, Beijing, China, Abstracts*, p. 197.

Area: China - northern

Topics: Faunal remains - *Mammuthus sungari*, Faunal remains - *Coelodonta antiquitatis*, Stratigraphy, Pollen records - China

Liu Tung-sheng, and Li Xing-guo

1984 Mammoths in China. In *Quaternary Extinctions: A Prehistoric Revolution*, edited by P. S. Martin and R. G. Klein, pp. 517-527. University of Arizona Press, Tucson, Arizona.

Mammoth fossil localities are widespread in China, from Raohe along the Wusuli River in the east to Tongwei of Gansgu Province in the west, and from Huma of Da Xingan Mountains in the north to Lushan in the south. Fossil localities are especially numerous in the Songliao Plain of northeast China. Mammoth is a representative of the *Mammuthus-Coelodonta* (woolly rhinoceros) fauna of the late Pleistocene in northeast China (Pei 1957).

The southern boundary of the distribution of the woolly mammoth (*Mammuthus primigenius*) in the northern hemisphere, Europe, and North America is roughly 40°N latitude (Zhou 1978). The distribution of the mammoth in China is approximately the same, occasionally reaching 35°N latitude.

Notes: Abstract taken from introduction.
Location: AEU SCI QE 741 Q2
Area: China - northeastern
Topics: Faunal remains - *Mammuthus*, Faunal remains - *Coelodonta antiquitatis*, Stratigraphy, Palaeontological sites - China, Climate history - China, Vegetation history - China, Zoogeography - *Mammuthus*, Faunal associations

Lu Youquan, Li Yi, and Jin Changzhu

1986 Mammalian Remains from the Late Pleistocene of Wurji, Nei Mongol. Vertebrata PalAsiatica 24(2):152-162.

The present paper deals with a new mammalian locality found at Wurji in eastern Nei Mongol (44°10'—44°30'N, 119°0'—110°30'E). Wurji Formation of late Late Pleistocene has been named for the fossil-bearing beds.

The Wurji Fauna consists of 14 species, belonging to 11 genera, 9 families, 4 orders. ... The extinct species of the Wurji Fauna ... are 14.3% in the fauna, less than those of other Late Pleistocene fauna, ... Most members of the Wurji Fauna are in common with the *Mammuthus-Coelodonta* Fauna in Northeast China. ... The bone radiocarbon dates the Wurji Fauna about 19,800 yr. B. P. and is at least not younger than the Upper Cave Fauna of Choukoutien (about 18,000 yr. B. P.) or the Gulongshan Fauna (about 17,610 yr. B.P.).

Rodentia (35%), most of the Perissodactyla, *Gazella przewalskyi* and *Bison* sp. of the Artiodactyla belong to the wet-cold grassland animals. According to quantitative analysis of pollen, the herb constitutes the majority (80%). The environment of the Wurji Fauna is the Wet-cold grassland, but with sparse trees and shrubs, too.

Notes: Abstract taken from summary. Two plates follow p. 162.
Area: China - northern
Topics: Palaeontological sites - China - northern, Faunal associations, Faunal remains - *Myospalax armandi*, Faunal remains - *Myospalax*, Faunal remains - *Myospalax psilurus*, Faunal remains - *Spermophilus undulatus*, Faunal remains - *Allactaga sibirica*, Faunal remains - *Canis lupus*, Faunal remains - *Mustela sibirica*, Faunal remains - *Crocuta crocuta ultima*, Faunal remains - *Equus przewalskii*, Faunal remains - *Equus hemionus*, Faunal remains - *Coelodonta antiquitatis*, Faunal remains - *Gazella przewalskii*, Faunal remains - *Bison*, Faunal remains - *Pseudaxis*, Archaeological sites - Zhoukoudian, Stratigraphy, Pollen analysis - China
Language: Chinese with English summary on p. 162.

Pei Wen-chung

1957 The Zoogeographical Divisions of Quaternary Mammalian Faunas in China. Vertebrata PalAsiatica 1(1):9-24.

... We are now able to give an account of the Quaternary mammals in most part of China, as for the province Taiwan and districts of Tibet and Sinkiang exploration has not well been made.

So far as the Quaternary mammalian fauna is concerned, it seems that China of today can well be subdivided into two main zoological provinces: North and South China. Another province of Huai River can also be added as the transitional zone in between the two. The fourth one, actually being a side branch of North China Province, includes the north-eastern part of Inner Mongolian Autonomous District, Heilungkiang and Kirin Provinces, or the North-East of China of the former time, or Northern Manchuria usually called by some foreigners. ...

... 4. During the Late Pleistocene time the eolian Loess was deposited in North China and the climate was supposedly cold and dry. However, it was not so cold and dry as some geologists suggested, because the water-buffalo, elephant, *Rhinoceros mercki*, etc. were inhabited [sic] in this region.

5. The present day regions as north-eastern part of Inner Mongolian Autonomous District, Provinces Heilungkiang and Kirin were very probably linked in Middle Pleistocene with North China by mammalian fauna, as *Rhinoceros mercki* was commonly found in these two parts of Chinese territory.

But coming to the Late Pleistocene time, by the investigation of mammalian fauna, the North-East province was widely separated from the North China Province. In the former province, cold fauna as *Mammonteus primigenius* and *Rhinoceros tichorhinus* (*Coelodonta antiquitatis*) are known while in the latter one, mild or even some southern mammals are present. At the end of Pleistocene some decidedly southern species such as *Cynaiturus jubatus* and *Paguma* invaded into the Upper Cave of Choukoutien in North China.

6. It seems, the mammals of to-day still maintain the Zoogeographical subdivision in China which outlined as early as the Pleistocene time. ...

Notes: Parts of introduction and conclusions used as abstract. Six charts (maps) follow p. 24.
Area: China
Topics: Zoogeography, Faunal remains - China, Palaeontology, Faunal associations
Language: English with Chinese summary on pp. 23-24.

Pei Wen-chung, Huang Wan-po, Chiu Chung-lang, and Mêng Hao

1958 Discovery of Quaternary Mammalian Fauna of Ch'ao-tsun, Chien-an County, Hopei Province. Vertebrata PalAsiatica 2(4):226-231.

Notes: Issue incorrectly paginated; first page number correct, end page number incorrect.
Location: AEU SCI QE 701 K95
Area: China - northern
Topics: Faunal remains - *Elephas namadicus*, Faunal remains - *Coelodonta antiquitatis*, Faunal remains - *Rhinoceros tichorhinus*, Faunal remains - *Cervus elaphus*, Faunal remains - *Spirocerus*, Faunal remains - *Bos primigenius*, Faunal remains - *Equus hemionus*, Palaeontological sites - China - northern, Stratigraphy

Qi Guoqin

1975 Quaternary Mammalian Fossils from Salawusu River District, Nei Mongol. Vertebrata PalAsiatica 13(4):239-249.

The article deals with vertebrate fossils discovered by a team of IVPP from Salawusu River (Sjara-osso-gol) Nei Mongol in 1963-1964. ...

Although most of them were described by M. Boule and P. Teilhard [sic] in 1928, our specimens were all collected in definite locality and horizon, and consequently they have importance in studing [sic] the Salawusu River layer itself and its upper and lower boundaris [sic].

The fossils were all collected from the lower sandy layer of main bank deposit of Salawusu River. The rhinoceros and tiger were burried [sic] in complete skeletons. It is distinct that the animals lived in the near-by locality before death.

Notes: Abstract taken from summary. Two plates follow p. 249.
Area: China - northern
Topics: Palaeontological sites - Salawusu, Faunal remains - *Felis tigris*, Faunal remains - *Crocuta ultima*, Faunal remains - *Equus przewalskii*, Faunal remains - *Camelus knoblocki*, Faunal remains - *Gazella*

przewalskii, Faunal remains - *Cervus elaphus*, Faunal remains - *Cricetulus griseus*, Faunal remains - *Alticola strachiyi*, Faunal remains - *Struthio*, Faunal remains - *Coelodonta antiquitatis*, Stratigraphy
Language: Chinese with English summary on p. 249.

Ting Meng-lin

1962 Discovery of a Late Pleistocene Elephant on the Loess Plateau of Northwestern China. Vertebrata PalAsiatica 6(4):406-407.

Location: AEU SCI QE 701 K95
Area: China - north-central
Topics: Faunal remains - *Palaeoloxodon namadicus*

Wei Chengyi

1964 New Discovery of Quaternary Mammal Fossils from Sungary-Liaoning Plain. Vertebrata PalAsiatica 8(3):322-323.

Location: AEU SCI QE 701 K95
Area: China - northeastern
Topics: Faunal remains - *Bison*
Language: Chinese

You Yuzhu, and Xu Qinqi

1981 The Late Pleistocene Mammalian Faunas of Northern China and Correlation with Deep-Sea Sediments. Vertebrata PalAsiatica 19(1):77-86.

It has been known for a long time that the mammalian fauna's composition varies from time to time during the late Pleistocene. In the recent years a lot of mammalian fossil localities and paleolithic sites of the late Pleistocene were found and excavated in Northern China. The deposits include alluvial, lacustrine-alluvial and loess sediments. They make up Terrace II or Terrace III of many rivers there.

It is indisputable that the late Pleistocene is characterized by the frequent changes of the mammalian fauna's composition. They reflect correspondingly the frequent climatic changes. We found there are three warm stages and three cold stages. Dingchun (Tingtsun) Fauna, Salawusu (Sjala-osso-gol) Fauna and the Upper Cave Fauna of Choukoutien correspond to the warm stages, while Xujiayao (Hsuchiayao) Fauna, Shiyu Fauna and Zhalainoer Fauna correspond to the cold stages.

The relationship between the mammalian faunas and the corresponding climates is as follows:

Age	Mammalian Fauna	Climate	Time (B.P.)
Holocene	Modern Fauna	as present	0-11,000
Upper	Zhalainoer Fauna	the coldest	11,000-15,000
	the Upper Cave Fauna	quite warm	15,000-25,000
Middle	Shiyu Fauna	a bit cold	25,000-35,000
	Salawusu Fauna	a bit warm	35,000-50,000
Lower	Xujiayao Fauna	quite cold	50,000-70,000
	Dingchun Fauna	the warmest	70,000-127,000

The mammalian species are strictly associated with definite climatic conditions. So they are very important for explaining the climate of the past. During the warm stages, the animals such as *Rhinoceros mercki*, *Bubalus*, *Elephas* (in Dingchun Fauna); *Bubalus*, *Sus*, *Elephas* (in Salawusu Fauna); *Myotis*, *Hystrix*, *Paguma*, *Elephas* (in the Upper Cave Fauna) were living in a forest-grassland environment. During the cold stages, the mammals such as *Coelodonta antiquitatis*, *Mammuthus*, *Lynx*, *Moschus* and *Capreolus* migrated from Eastern Siberia to Northern China. ...

Notes: Summary abbreviated for abstract.
Area: China - northern
Topics: Palaeontology, Faunal associations, Sea level changes, Climate history - China
Language: Chinese with English summary on pp. 84-86.

Zhang Zhen-hong, Zou Bao-ku, and Zhang Li-kai
1980 The Discovery of Fossil Mammals at Anping, Liaoyang. Vertebrata PalAsiatica 18(2):154-162.

This group of fossils was found in an accumulation in a crack in the south mountain in Anping, Liaoyang. They are in number of twenty-two species and genus. There are a good many of *Dicerorhinus merki*. There are also *Rusa unicolor*, *Felis youngi*, *Macacus robustus*, *Erinaceus olgae* among them. They are presentatives [sic] of Middle pleistocene [sic]. The main quality of the rock in the accumulation is brown-yellow and brown-red subclay with rich grains of calcified tuber and a little of rubble. Crushed stones were at the bottom of the accumulation. The discovery of this group of mammals has great significance to make researches into the division and comparison of geologic strata in the east of Liaoning and the natural evolution of Quaternary mammals in Northeast of China.

Notes: Two plates follow p. 162.
Area: China - northeastern
Topics: Faunal remains - China
Language: Chinese with English summary on p. 162

PART 5. ARCHAEOLOGY AND HUMAN HISTORY

Aigner, J. S.

1976 Chinese Pleistocene Cultural and Hominid Remains: A Consideration of their Significance in Reconstructing the Pattern of Human Biocultural Development. In *Colloque 7, Le Paléolithique Inférieur et Moyen en Inde, en Asie Centrale, en Chine et dans le sud-est Asiatique*, edited by A. K. Ghosh, pp. 65-90. Union Internationale des Sciences Préhistoriques et Protohistoriques, IX[e] Congrès, Nice, France, 13-18 Septembre 1976.

The absence of strong evidence for faunal exchanges during the last half of the Pleistocene, the strong tendency for certain morphological characteristics to persist in Chinese fossil and modern (Mongoloid) skeletons (and to be absent from other geographic skeletal series), and the notable conservatism in lithic technology of the known Chinese regional variants are cited in support of the hypothesis that China during the Pleistocene was largely and effectively isolated from western influence. This view contradicts the current reconstructions of noted physical anthropologists who assert that modern human populations evolved but once, in western Asia or eastern Europe, and proceeded to populate all of the Old World (and eventually the New), replacing indigenous hominid populations. The Chinese data support an alternative, polyphyletic model of human evolution; this in turn has consequences for our understanding of other important questions. These include the area of origination, the timing and morphology, and number of populations which peopled the New World, as well as the mechanisms and processes which hold the human species together.

Location: AEU HSS GN 772.3 A1 I62
Area: China
Topics: Hominid evolution, Human migration, Zoogeography, Faunal migration, Faunal associations, Vegetation history - China, Lithics, Lithic affinities, Archaeological sites - China, Archaeological sites - Zhoukoudian, Archaeological sites - Malta/Buryet, Archaeological sites - Anangula

1978 The Paleolithic of China. In *Early Man in America from a Circum-Pacific Perspective*, edited by A. L. Bryan, pp. 25-41. Occasional Papers No 1 of the Department of Anthropology, University of Alberta. Archaeological Researches International, Edmonton, Alberta.

Location: AEU HSS GN 17 E12
Area: China
Topics: Hominid evolution, Human migration, Faunal remains - China, Zoogeography, Faunal associations, Archaeological sites - China, Archaeological sites - Zhoukoudian, Lithics, Lithic affinities

1978 Important Archaeological Remains from North China. In *Early Paleolithic in South and East Asia*, edited by F. Ikawa-Smith, pp. 163-232. Aldine Publishing Company, Chicago, Illinois.

Notes: Review of archaeological sites in northern China with associated faunal remains.
Location: AEU HSS GN 772.3 A1 E12
Area: China - northern
Topics: Archaeological studies - China, Archaeological sites - China - northern, Archaeological sites - Djalai-nor, Archaeological sites - Ku-hsiang-t'un, Archaeological sites - Hailar, Faunal remains, Faunal associations, Lithics, Geoarchaeology, Archaeological sites - Zhoukoudian

Bae, K.

1992 Pleistocene Environment and Paleolithic Stone Industries of the Korean Peninsula. In *Pacific Northeast Asia in Prehistory: Hunter-Fisher-Gatherers, Farmers, and Sociopolitical Elites*, edited by C. M. Aikens and Song Nai Rhee, pp. 13-21. Washington State University Press, Pullman, Washington.

The major purpose of this paper is to present the level of Paleolithic studies in the Korean peninsula and adjacent areas, and to suggest potential explanations of patterns observed in archaeological and environmental evidence. Considering that the Korean peninsula is located on the far eastern edge of the Eurasian continent and that many early Paleolithic sites have been found in the northeastern part of China including southern Manchuria, the Korean Paleolithic evidence is of great interest to Pleistocene archaeologists in terms of hominid dispersal and adaptation to the temperate environment of northeastern Asia.

The first evidence of Pleistocene hominids in Korea was found at Dongkwanjin in 1935. However, it was not until early in the 1960s, with the discovery of two Paleolithic sites, Kulpori in the north and Sokchang-ni in the south, that a new phase of Paleolithic study began in Korea. Currently, more than 20 locations have been reported that yield some sort of Pleistocene material. Very few sites have yielded stone artifacts and faunal material at the same time. The number of sites is expected to increase very rapidly in the near future because extensive surveys are being carried out in major river basins.

Notes: Papers presented at the Circum-Pacific Prehistory Conference, Seattle, August 1989. Abstract taken from introduction.
Location: AEU HSS GN 855 E27 P117
Area: Korea
Topics: Palaeontological sites - Korea, Archaeological sites - Korea, Zoogeography, Faunal remains - *Mammuthus primigenius*, Faunal remains - *Bison priscus*, Faunal remains - *Crocuta crocuta ultima*, Faunal remains - *Equus caballus*, Faunal remains - *Hyaena*, Faunal remains - *Hydropotes hydropotes*, Faunal remains - *Lepus*, Faunal remains - *Lutra lutra*, Faunal remains - *Moschus moschiferus*, Faunal remains - *Ursus thibetanus*, Faunal remains - *Bufo*, Faunal remains - *Pseudaxis*, Faunal remains - *Tetrastes bonasi*, Vegetation history - Korea, Climate history - Korea, Lithics, Lithic affinities, Human/hominid remains, Hominid evolution, Dating - uranium series

Binford, L. R., and C. Ho
1985 Taphonomy at a Distance: Zhoukoudian, "The Cave Home of Beijing Man"? Current Anthropology 26:413-442.

Location: AEU PMC GN 1 C97
Area: China - eastern
Topics: Taphonomy, Archaeological sites - Zhoukoudian, Human/hominid remains, Hominid evolution, Geoarchaeology, Faunal remains - China, Archaeological studies - China, Lithics, Bone modification

Binford, L. R., and N. M. Stone
1986 Zhoukoudian: A Closer Look. Current Anthropology 27:453-475.

Given our current knowledge, there are no recognizable characteristics of hominid hunting in the remaining Zhoukoudian faunal collections. All positive characteristics point instead to hominid scavenging. By far the dominant contributors to Zhoukoudian bone accumulations were denning animals, not hominids. We conclude that previous interpretations presenting *H. erectus* as a big-game hunter are no longer defensible. The use of fire may well have characterized the later occupations at Zhoukoudian, but none of these glimpses of the past justify the assumption that the Zhoukoudian occupants were organized like modern hunters.

Notes: Conclusions used as abstract.
Location: AEU PMC GN 1 C97
Area: China - eastern
Topics: Archaeological sites - Zhoukoudian, Faunal remains - China, Taphonomy, Bone modification, Hominid evolution, Archaeological studies - China

1987 On Zhoukoudian: Reply to Comments. Current Anthropology 28:102-105.

Notes: Reply to comments in Binford and Stone 1986 (Current Anthropology, Volume 27, pp. 453-475).

Location: AEU PMC GN 1 C97
Area: China - eastern
Topics: Archaeological sites - Zhoukoudian, Taphonomy, Bone modification, Faunal remains - China

Chang, K.

1963 Prehistoric Archaeology in China: 1920-60. Arctic Anthropology 1(2):29-61.

Notes: Review of Chinese palaeolithic.
Location: AEU PMC GN 1 A68
Area: China
Topics: Archaeological sites - China, Archaeological sites - Zhoukoudian, Archaeological sites - Djalai-nor, Archaeological sites - Hailar, Archaeological sites - Ku-hsiang-t'un, Archaeological sites - China - northern, Geoarchaeology, Archaeological studies - China, Human/hominid remains, Hominid evolution, Vegetation history - China, Climate history - China, Lithics, Lithic affinities, Faunal remains - China, Review of archaeology - China

1977 *The Archaeology of Ancient China*. Yale University Press, New Haven, Connecticut. 535 pp.

Notes: See especially Chapter 1: "The Environmental Setting and Time Scale" (pp. 19-38) and Chapter 2: "Palaeolithic and Mesolithic Foundations" (pp. 39-79).
Location: AEU HSS DS 727 C45
Area: China
Topics: Climate history - China, Glacial history - China, Faunal associations, Stratigraphy, Pollen records - China, Sea level changes, Tectonism, Loess, Molluscs, Archaeological studies - China, Archaeological sites - China, Archaeological sites - Shiyu, Human/hominid remains, Archaeological sites - Zhoukoudian, Lithics, Lithic affinities, Faunal remains - *Megaloceros ordosianus*, Faunal remains - *Equus hemionus*, Faunal remains - *Equus przewalskii*, Faunal remains - *Hyaena ultima*, Faunal remains - *Ursus spelaeus*, Faunal remains - *Elephas*, Review of archaeology - China

Chen Chun

1985 New Discoveries in Northeast China. Current Research in the Pleistocene 2:93-94.

Location: AEU HSS E 61 C97
Area: China - northeastern
Topics: Archaeological sites - China - northeastern, Archaeological sites - Angangxi, Lithics, Lithic affinities, Faunal remains - *Coelodonta antiquitatis*, Faunal remains - *Mammuthus*, Plant macrofossils - wood

Chen, C., and J. W. Olsen

1990 China at the Last Glacial Maximum. In *The World at 18 000 BP, Volume 1, High Latitudes*, edited by O. Soffer and C. Gamble, pp. 276-295. Unwin Hyman, London, England.

Location: AEU HSS GN 741 W928
Area: China
Topics: Archaeological sites - China, Archaeological sites - Shiyu, Archaeological sites - Zhoukoudian, Archaeological sites - Xiachuan, Cultural traditions, Lithics, Lithic affinities, Faunal remains - China, Human/hominid remains, Human migration, Review of archaeology - China

Chen Chun, and Wang Xiang-Qian

1989 Upper Paleolithic Microblade Industries in North China and their Relationships with Northeast Asia and North America. Arctic Anthropology 26(2):127-156.

Microblade industries of North China have been studied in detail only during the past 30 years, although they were known since the early decades of this century. Two important sites, Xiachuan (24,000-14,000 B.P.) and Xueguan (13,550 B.P.), are described here as microblade technology; conical and wedge-shaped cores typify the first stage, while the second is characterized by an elaboration of wedge-shaped cores and a decline of conical ones. Microcore preparation is emphasized as an avenue for comparing Paleolithic industries found in North China, Japan, Northeast Asia, and northwestern North America. A review of the known industries from these regions suggests that they derived from a common cultural heritage, but that (a) Japanese industries seem to correspond techno-typologically to early and middle stages of the North China sequence, (b) the Dyuktai industries of Northeast Asia equate with the middle stage of the North China sequence, and (c) the American Paleo-Arctic tradition may have derived from the Dyuktai industries.

Location: AEU PMC GN 1 A68
Area: China - northeastern, Japan, Siberia - eastern, Western Beringia, Mongolia, Eastern Beringia, Kamchatka
Topics: Lithics, Lithic affinities, Archaeological sites - China - northeastern, Archaeological sites - Xiachuan, Archaeological sites - Hutouliang, Archaeological sites - Shiyu, Archaeological sites - Angangxi, Archaeological sites - Japan, Archaeological sites - Japan - Hokkaido, Archaeological sites - Mongolia, Archaeological sites - Siberia - eastern, Archaeological sites - Diuktai Cave, Archaeological sites - Lake Ushki, Archaeological sites - Eastern Beringia, Archaeological sites - Healy Lake, Archaeological sites - Dry Creek, Archaeological sites - Onion Portage, Archaeological sites - Trail Creek, Archaeological sites - Tangle Lakes, Cultural traditions, Cultural traditions - Diuktai, Geoarchaeology, Dating - radiocarbon, Faunal remains - *Coelodonta antiquitatis*, Faunal remains - *Palaeoloxodon namadicus*, Faunal remains - *Rana*, Faunal remains - *Struthiolithus*, Faunal remains - *Microtus brandtoides*, Faunal remains - *Citellus citellus mongolicus*, Faunal remains - *Myospalax fontanieri*, Faunal remains - *Cricetulus varians*, Faunal remains - *Canis lupus*, Faunal remains - *Equus przewalskii*, Faunal remains - *Equus hemionus*, Faunal remains - *Cervus*, Faunal remains - *Bos*, Faunal remains - *Procapra picticaudata*, Faunal remains - *Gazella subgutturosa*, Faunal remains - *Spirocerus*, Faunal remains - *Sus scrofa*

Chia Lan-Po

1976 On the Origin of Microlithic Industries in East Asia. In *Colloque 18, Le Premier Peuplement de L'Archipel Nippon et des Iles du Pacifique: Chronologie, Paléogéographie, Industries*, edited by C. Serizawa, pp. 7-9. Union Internationale des Sciences Préhistoriques et Protohistoriques, IX^e^ Congrès, Nice, France, 13-18 Septembre 1976.

Location: AEU HSS GN 772.3 A1 I625
Area: China - northern
Topics: Archaeological sites - China, Archaeological sites - Shiyu, Archaeological sites - Zhoukoudian, Archaeological sites - Japan, Lithics, Lithic affinities

Chow Ben-Shun

1986 The Horse of Pre Ch'in Period in China: A Study of Early Man's Exploitation of Animals. In *Cultural Attitudes to Animals Including Birds, Fish and Invertebrates, Volume 1*. Paper presented at the World Archaeological Congress. 15 pp. Allen and Unwin, Southampton, England.

This paper will outline the evidence for the history of the horse in China and will suggest changes in human society that might explain the developments observed.

Notes: Abstract taken from introduction.
Area: China - northern
Topics: Faunal remains - *Equus przewalskii*, Faunal remains - *Equus hemionus*, Faunal associations, Faunal extinction, Zoogeography - *Equus*, Human/hominid remains, Archaeological sites - China, Archaeological sites - Zhoukoudian, Archaeological sites - Shiyu, Archaeological sites - Hutouliang, Faunal remains - *Megaloceros ordosianus*, Faunal remains - *Coelodonta antiquitatis*, Faunal remains -

Bos primigenius, Faunal remains - *Palaeoloxodon*, Faunal remains - *Gazella przewalskii*, Faunal remains - *Mammuthus primigenius*, Faunal remains - *Alces alces*, Faunal remains - *Rangifer*, Climate history - China, Loess, Cultural traditions

Freeman Jr., L. G.

1977 Paleolithic Archeology and Paleoanthropology in China. In *Paleoanthropology in the People's Republic of China*, edited by W. W. Howells and P. J. Tsuchitani, pp. 79-113. Committee on Scholarly Communication with the People's Republic of China (CSCPRC) Report No. 4. National Academy of Sciences, Washington, D.C.

Notes: A trip report of the American Paleoanthropology Delegation.
Location: AEU HSS GN 855 C6 A512
Area: China
Topics: Archaeological studies - China, Archaeological sites - China, Archaeological sites - Zhoukoudian, Human/hominid remains, Lithics, Lithic affinities

Gabori, M.

1963 New Data on Palaeolithic Finds in Mongolia. Translated by B. F. Merbs. Asian Perspectives 7:105-112.

Location: AEU PMC DS 514 A83
Area: Mongolia
Topics: Lithics, Archaeological sites - Mongolia, Archaeological sites - Malta/Buryet, Archaeological sites - Afontova Gora, Archaeological studies - Mongolia, Lithic affinities

Gai Pei

1985 Microlithic Industries in China. In *Palaeoanthropology and Palaeolithic Archaeology in the People's Republic of China*, edited by Wu Rukang and J. W. Olsen, pp. 225-241. Academic Press, Orlando, Florida.

Location: AEU HSS GN 772.32 C6 P17
Area: China - northern, Siberia, Western Beringia, Eastern Beringia
Topics: Lithics, Lithic affinities, Archaeological sites - China, Archaeological sites - Shiyu, Archaeological sites - Xiachuan, Archaeological sites - Hutouliang, Archaeological sites - Angangxi, Archaeological sites - China - northern, Faunal remains - *Bubalus*, Faunal remains - *Struthio*, Faunal remains - *Crocuta*, Faunal remains - *Cervus elaphus*, Faunal remains - *Megaloceros ordosianus*, Faunal remains - *Coelodonta antiquitatis*, Faunal remains - *Equus przewalskii*, Faunal remains - *Equus hemionus*, Archaeological studies - China, Archaeological sites - Diuktai Cave, Cultural traditions - Diuktai, Archaeological sites - Healy Lake, Archaeological sites - Alaska, Dating - uranium series

Ho, C., and Z. Li

1987 Paleolithic Subsistence Strategies in North China. Current Research in the Pleistocene 4:7-9.

Location: AEA PMA/ASA
Area: China - northern
Topics: Lithics, Archaeological sites - China, Archaeological sites - Xiachuan, Archaeological sites - Shiyu, Archaeological sites - Hutouliang, Archaeological sites - Zhoukoudian, Cultural traditions, Climate history - China, Vegetation history - China, Faunal remains - China, Faunal remains - *Equus przewalskii*, Faunal remains - *Equus hemionus*, Faunal remains - *Coelodonta antiquitatis*, Faunal remains - *Megaloceros ordosianus*, Faunal remains - *Cervus elaphus*, Faunal remains - *Bos primigenius*

Hsu, S.

1981 The Ecology of Chinese Neolithic Cultural Expansion. In *The China Geographer Number 11: Agriculture*, edited by C. W. Pannell and C. L. Salter, pp. 1-26. Westview Press, Boulder, Colorado.

Location: AEU HSS GB 316 C53
Area: China
Topics: Archaeological sites - China, Archaeological sites - Zhoukoudian, Archaeological sites - Djalai-nor, Geoarchaeology, Loess, Faunal associations, Glacial history - China, Climate history - China, Human/hominid remains

Huang Weiwen, Zhang Zhenhong, Liao Zhendi, Yu Haiming, Chu Benjun, and Gao Zhencao

1984 Discovery of Paleolithic Artifacts at Angangxi of Jijihaer, Heilongjiang. Acta Anthropologica Sinica 3(3):234-243.

The materials described in this paper came from Daxingtun lecality [sic], (47°2' N, 123°53'E) near Angangxi of Jijihaer, Heilongjiang Province in Northeast China. This locality had been investigated in 1981 and 1982. The collection includes stone artifacts, burned bones, ash from cooking fire and mammal fossils. All of them were unearthed from the river-lake deposit of Late Pleistocene. Above Pleistocene layer, there are river and lake deposits as well as aeolian dune in succession of strata within the Holocene. The lake deposit consists of black subsand soil which yielded microliths, polished tools, potterys [sic], bone and horn artifacts as well as ornaments all of Neolithic age. This layer was dated to be 7500—4800 B. P. by C^{14}.

The mammal fossils associated with paleoliths included *Lepus* sp., *Ochotona daurica*, *Citellus* cf. *mongolicus*, *Cricetulus* cf. *griseus*, *Microtus epiratticeps*, *Equus przewalskyi*, *?Equus* sp., *Bison (P.) exiguns* and *?Bos* sp., totaling 9 species. They were common members of "Mammuthus-Coleodonta Fauna" [sic] of Northeast China of Late Pleistocene. Among them, *Equus przewalskyi*, *Bison (P.) exiguns* and *Bos* sp. are extinct species. *Artemisia*, Chenopodiaceae, Humulus [sic], Gramineae, Compositae and Betulaceae were also identified by spore-pollen analysis in the same layer. The fauna and flora mentioned above represent an environment mainly of steppe under dry-cold climade [sic].

The stone artifacts, totaling 68, mainly made of jasper, agate and chert, which came from the gravel bed of old river nearby. They contain cores, flakes and tools. The methods of direct percussion by mobil hammer and bipolar were used in flaking and toolmaking, Besides [sic], indirect percussion and pressure were also used on rare occasion. The striking platform can be classified to three kinds; corkex [sic], unfaceted and faceted. The blades are dominant among flakes and a lot of them were knocked on one or two ends in order to insert into wood, bone or antler as the edge of a knife. The tools consist of scrapers, burins and a piece of chopper. The scrapers and burins are various in types, including single side scraper, double side scraper, multiside scraper, backed scraper, end scraper, nosed end scraper, burin on break, burin on retouched edge, dihedrad [sic] burin, burin double on truncation and burin-scraper.

The dimensions of Angangxi artifacts are very small. On the technical style, the Angangxi assemblage very like those of North China's small-tools tradition represented by Peking Man Culture. It suggesta [sic] that Angangxi assemblage is a developed culture of this tradition towards the northeast of Asia.

Area: China - northeastern
Topics: Pollen analysis - China, Lithics, Faunal remains - *Coelodonta antiquitatis*, Faunal remains - *Lepus*, Faunal remains - *Ochotona daurica*, Faunal remains - *Citellus mongolicus*, Faunal remains - *Cricetulus griseus*, Faunal remains - *Microtus epiratticeps*, Faunal remains - *Equus przewalskii*, Faunal remains - *Bison exiguus*, Faunal remains - *Bos*, Faunal associations, Archaeological sites - Angangxi, Geoarchaeology
Language: Chinese with English summary on pp. 242-243.

Jia Lanpo

1980 *Early Man in China*. Foreign Languages Press, Beijing, China. 86 pp.

Location: AEU HSS GN 855 C6 C53
Area: China

Topics: Human/hominid remains, Hominid evolution, Archaeological sites - China, Archaeological sites - Zhoukoudian, Archaeological sites - Xiachuan, Archaeological sites - Shiyu, Archaeological sites - Hutouliang, Lithics, Geoarchaeology, Human migration, Faunal remains, Faunal remains - *Ailuropoda melanoleuca*, Faunal remains - *Rhinoceros sinensis*, Faunal remains - *Megatapirus*, Faunal remains - *Megaloceros ordosianus*, Faunal remains - *Bubalus wansjocki*, Review of archaeology - China

Jia Lanpo, and Huang Weiwen

1985 The Late Palaeolithic of China. In *Palaeoanthropology and Palaeolithic Archaeology in the People's Republic of China*, edited by Wu Rukang and J. W. Olsen, pp. 211-223. Academic Press, Orlando, Florida.

Location: AEU HSS GN 772.32 C6 P17
Area: China
Topics: Archaeological sites - China, Archaeological sites - Zhoukoudian, Archaeological sites - Shiyu, Archaeological sites - Xiachuan, Archaeological sites - Hutouliang, Archaeological sites - China - northern, Geoarchaeology, Loess, Palaeosols, Faunal associations, Vegetation history - China, Climate history - China, Lithics, Lithic affinities, Faunal remains - *Equus przewalskii*, Faunal remains - *Equus hemionus*, Faunal remains - *Gazella*, Faunal remains - *Gazella przewalskii*, Faunal remains - *Bos*, Faunal remains - *Cervus*, Faunal remains - *Cervus elaphus*, Faunal remains - *Struthio*, Faunal remains - *Microtus brandtoides*, Faunal remains - *Myospalax fontanieri*, Faunal remains - *Struthiolithus*, Faunal remains - *Canis lupus*, Faunal remains - *Gazella subgutturosa*, Faunal remains - *Sus scrofa*, Faunal remains - *Myospalax psilurus*, Faunal remains - *Spermophilus undulatus*, Faunal remains - *Citellus undulatus*, Faunal remains - *Bos primigenius*, Faunal remains - *Palaeoloxodon namadicus*, Faunal remains - *Coelodonta antiquitatis*, Faunal remains - *Camelus knoblocki*, Faunal remains - *Megaloceros ordosianus*, Faunal remains - *Bubalus wansjocki*, Faunal remains - *Crocuta ultima*, Faunal remains - *Ursus spelaeus*, Faunal remains - *Mammuthus primigenius*, Faunal remains - *Equus caballus*, Faunal remains - *Elephas*, Faunal remains - *Bison exiguus*, Human/hominid remains, Archaeological studies - China, Review of archaeology - China

1985 On the Recognition of China's Palaeolithic Cultural Traditions. In *Palaeoanthropology and Palaeolithic Archaeology in the People's Republic of China*, edited by Wu Rukang and J. W. Olsen, pp. 259-265. Academic Press, Orlando, Florida.

Location: AEU HSS GN 772.32 C6 P17
Area: China
Topics: Archaeological sites - China, Archaeological sites - Zhoukoudian, Archaeological sites - Shiyu, Archaeological sites - Xiachuan, Archaeological sites - Hutouliang, Cultural traditions, Lithics

1991 The Palaeolithic Culture of China. Quaternary Science Reviews 10:519-521.

Location: AEU SCI QE 696 Q245
Area: China
Topics: Archaeological studies - China, Geoarchaeology, Loess, Lithics, Lithic affinities, Faunal associations, Human/hominid remains, Archaeological sites - China, Archaeological sites - Zhoukoudian, Archaeological sites - Xiachuan

Jiang Peng

1982 A Fossil Human Tooth from Jilin Province. Vertebrata PalAsiatica 20(1):65-71.

In 1964, the research workers of the Museum of Jilin Province and other units found out a tooth of fossil man and a lot of mammalian fossils in a cave deposit, which is situated at Shimenshan village, lying 2.5 km. to the southeast of Mingyne town, Antu District. The basement rock of the cave, dipping NE 50° ∠62°, is the lower Permian. [sic] limestone of Miaoling Formation. This cave is near by the Burhatong River to the south with an elevation of 365 m, being 25 m high above the river bed. There are four layers of deposit from lower to upper in the cave.

The tooth of Antu Man (*Homo sapiens antuensis*), which is the first praemolar one of the lower right side, has been petrified and well preserved. Its field number is 501. According to observation of the tooth, we know that it is in poor health. It fell ill with many kinds of illnesses such as dental caries and withering in periodontosis etc. Judging from the degree of wearing and tearing of the chewing surface, it is of fourth degree of modern. It is suppose [sic] to be a man of middle age.

The mammalian fossils associated with fossil man in the cave deposit, total 10 families, 16 genera and 19 species, 4 extinct species included. These fossils all belong to the *Mammuthus primigenius-Coelodonta antiquitatis* fauna.

We didn't find in the vourse [sic] of digging and managing, any human tools. But we found, in the course of arranging the specimens, some coarse or fine striae on the surfaces of the fossil animals. They seem to be made by cut and blow. According to the age determination of C^{14} of the *Mammuthus primigenius* (35,400±1,800y. Bp. 26,600±550y. Bp.) and the *Coelodonta antiquitatis* (28,700±750y. Bp.), the geological time of Antu Man is the late of late Pleistocene. Its cultural age belongs to Late-Palaeolithic.

Notes: Three plates follow p. 71.
Area: China - northeastern
Topics: Human/hominid remains, Faunal remains - *Coelodonta antiquitatis*, Faunal remains - *Mammuthus primigenius*, Faunal remains - *Felis tigris*, Faunal remains - *Equus przewalskii*, Faunal remains - *Ursus arctos*, Faunal remains - *Pseudaxis*, Faunal associations, Pollen analysis - China
Language: Chinese with English abstract on pp. 70-71.

1990 Paleolithic Artifacts Found in Daqiaotun Site of Yushu County Jilin Province. Acta Anthropologica Sinica **9(1):8-15.**

During September and November of 1988, archaeologists of Jilin Province found cultural remains and a fair number of mammalian fossils near Daqiaotun village in Yushu county. These were laid in the fine and course [sic] sand layers, black and greygreen silt, in the first terrace of the Lalin River tributary. We found 17 stone artifacts, including cores, flakes and manufactured scrapers, points (or pointed tools) and chopper. Among these artifacts 47% were tools. Of these tools 62.5% were scrapers. The tools were usually retouched by dirert [sic] percussion; it was mainly trimmed on the dorsal surface, which was the tradition way for retouching stone tools in northern part of China. Apart from these, two bone artifacts were also found. Of these, one was a scraper made of a fragment of the incisor of a mammoth, which is described in the paleolithic materials of China for the first time.

Mammalian fossils found in the same level with the cultural remains totaled [sic] 15 types, belonged [sic] to 8 orders, 10 families and 13 genera. While the majority of the fossil remains are of existing species, a small percentage of the animal species in the assemblage are now extinct. In the process of examining these animal fossils, we discovered many artificial traces and animal marking on the fossil surface. Observing the strata, from which came the cultural remains and animal fossils, we realized that Daqiaotun site was not a human settlement in the Paleolithic, but the concentration of all these varities [sic] and the large number of fossils point out a relation with fransitional [sic] redepost [sic].

The cultural remains and animal fossils of Daqiaotun site were all found in the first terrace, and should belong to the Holocene. But based on the characteristics of the stone, bone artifacts and the nature of the animal fossils, they are probably related to the Late Paleolithic age. They may, therefore, be redeposited from Guxiangtun formation of the Late Pleistocene here.

Notes: One plate follows p. 15.
Area: China - northeastern
Topics: Archaeological sites - China - northeastern, Lithics, Bone modification, Geoarchaeology, Faunal remains - *Mammuthus*, Faunal remains - China
Language: Chinese with English abstract on p. 15.

Jiang Peng, and Ho Chuan Kun

1986 Hunting Strategies of Late Paleolithic Man in Northeast China. Current Research in the Pleistocene 3:92-94.

The purpose of this paper is to discuss the hunting strategies of late Paleolithic man by using the most recently found archaeological material from this area. Twelve late Paleolithic sites have been found in this portion of China: four cave sites and eight other sites, most of which are located in the central and southern part of northeastern China.

Both faunal and pollen data indicate a tundra and periglacial environment during the late Paleolithic. It is estimated that the temperature was 6°C colder than it is today. *Homo sapiens* could only gather during the short summer; the rest of the year they devoted to hunting. This is in contrast to the hunting behavior of *Homo sapiens* in temperate, warm temperate, and subtropical zones. It is possible that there was seasonal food storage (e.g., of meat) in northeastern China during the late Paleolithic.

Notes: Abstract taken from introduction.
Location: AEU HSS E 61 C97
Area: China - northeastern
Topics: Archaeological sites - China, Lithics, Faunal remains - *Mammuthus primigenius*, Faunal remains - *Coelodonta antiquitatis*, Faunal remains - *Equus przewalskii*, Faunal remains - *Bos primigenius*, Faunal remains - *Cervus canadensis*

Movius Jr., H. L.

1956 New Paleolithic Sites, Near Ting-Ts'un in the Fen River, Shansi Province, North China. Quaternaria 3:13-26.

A very important series of Palaeolithic sites were discovered in North China, near the village of Ting-Ts'un, Shansi. These localities were found during the course of commercial operations in a sand pit. Excavations led to the finding of vertebrate fossils at no less than fourteen open-air localities within 10 kilometers of Ting-Ts'un, and eleven of them have yielded stone implements. Furthermore, at the most important single site, known as Ting-Ts'un - Locality 54:100, three fossilized human teeth were recovered. In all cases the fossiliferous horizon occupied a similar stratigraphic position in the sections investigated. It consists of a series of gravel layers that consistently are exposed in the upper portion of a series of water-laid sands, gravels and slits [sic], which in turn are overlain by reddish clays and loess.

Notes: Abstract taken from introduction.
Location: AEU SCI QE 741 Q13
Area: China - northern
Topics: Archaeological sites - China, Archaeological sites - Zhoukoudian, Geoarchaeology, Faunal remains - China, Lithics, Human/hominid remains

Okladnikov, A. P.

1978 The Paleolithic of Mongolia. In *Early Paleolithic in South and East Asia*, edited by F. Ikawa-Smith, pp. 317-325. Aldine Publishing Company, Chicago, Illinois.

Location: AEU HSS GN 772.3 A1 E12
Area: Mongolia, Western Beringia
Topics: Archaeological studies - Mongolia, Archaeological sites - Mongolia, Archaeological sites - Afontova Gora, Archaeological sites - Malta/Buryet, Lithics, Lithic affinities

Olsen, J. W.

1987 Recent Developments in the Upper Pleistocene Prehistory of China. In *The Pleistocene Old World: Regional Perspectives*, edited by O. Soffer, pp. 135-146. Interdisciplinary Contributions to Archaeology. Plenum Press, New York, New York.

It is clear that the quantity of Paleolithic remains that have come to light in China in the past two decades precludes continued adherence to simplistic unilinear developmental models as explanations for the differences demonstratable among assemblages. In addition to diachronic variation, China's Pleistocene cultures are also typified by substantial synchronic local adaptations to particular ecological regimes. The influence of this regionalization on the emergence of discrete Paleolithic industrial traditions in China is one explanation for the substantial assemblage variability that can now be amply demonstrated. A less parochial approach augmented by additional archaeological and chronometric data may allow not only the recognition of regional traditions with greater precision but also permit the formulation of models that seek to explain this variability.

Notes: Abstract taken from conclusion. M. Jochim (series ed.).
Location: AEU HSS GN 771 P724
Area: China
Topics: Archaeological studies - China, Archaeological sites - China, Archaeological sites - Hutouliang, Archaeological sites - Zhoukoudian, Archaeological sites - Shiyu, Archaeological sites - Xiachuan, Lithics, Cultural traditions, Faunal associations, Faunal remains - *Equus*, Faunal remains - *Gazella*, Faunal remains - *Bos*, Faunal remains - *Cervus*, Faunal remains - *Struthio*, Faunal remains - *Microtus*, Faunal remains - *Myospalax*, Faunal remains - *Canis*, Faunal remains - *Sus*

Reynolds, T. E. G.
1986 On Agents of Bone Accumulation at Zhoukoudian. Current Anthropology 27:368-369.

Notes: Comments on Binford and Ho 1985 (Current Anthropology 26: 413-442).
Location: AEU PMC GN 1 C97
Area: China - eastern
Topics: Archaeological sites - Zhoukoudian, Taphonomy, Bone modification

Sohn Pow-key
1974 Palaeolithic Culture of Korea. Korea Journal 14(4):4-11.

The study of palaeolithic culture in Korea is a new subject. Only during the last decade have palaeolithic industries been brought to light in Korea. Although there was an earlier claim for such remain by Naora Nobuo in 1940, it was neglected, or rather rejected, by Japanese scholars. The first excavation of a palaeolithic site with a definite archaeological aim was made in the spring of 1963 at Kulp'o-ri in the northeastern part of Korea.

The second excavation, a long-range program for the past ten years under the auspices of the Yonsei University Museum, has brought to light a well-stratified site at Sŏkchang-ni on a river terrace of the Kŭm River, approximately 200 km south of Seoul. Besides, four cave sites were so far excavated; three of the four yielded fossilized fauna and chipped instruments. Two of the caves were well-stratified, yielding numerous fossilized fauna and bone tools.

There are also thirty-odd sites that were located by surface finds in the riverine and lacustrine area of various parts of Korea. Palaeolithic studies in Korea are very promising as much of the data will shed new light on the prehistoric studies of Asia.

Notes: Abstract taken from introduction.
Location: AEU GOV DOC KO1 NCU K54
Area: Korea
Topics: Archaeological sites - Korea, Lithics, Lithic affinities, Geoarchaeology, Faunal remains - *Felis*, Faunal remains - *Ursus spelaeus*, Faunal remains - *Ursus arctos*, Faunal remains - *Hyaena*, Faunal remains - *Mustela*, Faunal remains - *Pseudaxis grayi*, Faunal remains - *Microtus brandtoides*, Faunal remains - *Microtus epiratticeps*, Pollen records - Korea

Sohn, P.

1976 The Upper Palaeolithic of Korea. In *Colloque 18, Le Premier Peuplement de L'Archipel Nippon et des Iles du Pacifique: Chronologie, Paléogéographie, Industries*, edited by C. Serizawa, p. 31. Union Internationale des Sciences Préhistoriques et Protohistoriques, IX[e] Congrès, Nice, France, 13-18 Septembre 1976.

Location: AEU HSS GN 772.3 A1 I625
Area: Korea
Topics: Faunal remains - Korea, Pollen records - Korea, Lithics

1978 The Early Paleolithic Industries of Sŏkchang-ni, Korea. In *Early Paleolithic in South and East Asia*, edited by F. Ikawa-Smith, pp. 233-245. Aldine Publishing Company, Chicago, Illinois.

Location: AEU HSS GN 772.3 A1 E12
Area: Korea
Topics: Archaeological sites - Korea, Lithics, Geoarchaeology, Pollen records - Korea, Faunal remains - Korea

Sohn Pokee, and Han Chang-gyuan

1991 Sourcing the Obsidian Tools in Korea: Prehistoric Tools and Transport. In *INQUA, 13th International Congress, Beijing, China, Abstracts*, p. 335.

Area: Korea, Japan
Topics: Lithics, Lithic affinities, Human migration

Sun Jianzhong, Wang Yuzhue, and Jiang Peng

1981 A Paleolithic Site at Zhou-Jia-You-Fang in Yushu County Jilin Province. Vertebrata PalAsiatica 19(3):281-291.

Zhou-jia-you-fang, a little village, is situated on the northen [sic] bank of a small branch of the Songhua river (Lat. 44°44'N Long 126°21'E). A paleolithic site was discovered in October 1977 by the authors and, some stone and bone implements was found there. These cultural remains of the ancient human consist of stone cores, stone flakes, stone points, stone scrapers and a spade made in a piece of *Mammuthus* tooth, a bone spear head, bone points, bone scrapers, bone digging instruments. Basing on the characters of these cultural remains, they are judged to belong to the early stage of the late paleolithic period.

Almost all these cultural remains are laied [sic] together with the fossils of the *Mammuthus-Coeledonta* [sic] Fauna.

At first, most of these cultural remains were dug out from the Guxiangtun formation, which belongs to the late Pleistocene period, dated by the C_{14} determinations of the wood fossils from the Locality 1. in >40,000 years B.P. and from the Locality 4 in 26,740±735 B.P. or 26,100±850 B.P.

But on the other hand, some cultural remains, together with the mammalian fossils, were also put out from the middle holocenic strata, named Tantu formation. Four wood fossils from the Tantu formation at Locality 2 mark the following C_{14} dates: 7,380±100 B.P., 7,300±100 B.P., 7,250±140 B.P., and 6,060±100 B.P.

But a leg of *Coelogonta* [sic] dug from the same locality is dated by the C_{14} determination in 31,800±900 B.P. It shows that, these cultural remains together with the mammalian fossils from the Tantu formation were removed from the Guxiangtun formation. So all the cultural remains found in this region should belong to a single culture of the paleolithic human. Perhaps, the masters of this culture lived between 40,000 — 70,000 years B.P.

Mammuthus-Coelodonta fauna is a typical periglacial fauna.

So it is known that, the masters of this culture had lived in the circumstance of a cold climate of the last glacial period. They have developed their shiny culture in bitter struggle against the bed [sic] natural conditions. They lived on hunting and collecting.

Notes: Three plates follow p. 291.
Area: China - northeastern
Topics: Archaeological sites - China - northeastern, Lithics, Bone modification, Faunal remains - *Coelodonta*, Faunal remains - *Mammuthus*, Faunal associations
Language: Chinese with English abstract on p. 291.

Wang Yuping, and J. W. Olsen

1985 Aspects of the Inner Mongolian Palaeolithic. In *Palaeoanthropology and Palaeolithic Archaeology in the People's Republic of China*, edited by Wu Rukang and J. W. Olsen, pp. 243-258. Academic Press, Orlando, Florida.

Location: AEU HSS GN 772.32 C6 P17
Area: Mongolia, China - northern
Topics: Archaeological sites - Mongolia, Lithics, Lithic affinities, Faunal remains - *Coelodonta antiquitatis*, Faunal remains - *Equus przewalskii*, Faunal remains - *Bos primigenius*, Faunal remains - *Procapra picticaudata*, Faunal remains - *Cervus elaphus*, Archaeological sites - China - northern, Archaeological studies - China - northern, Loess, Palaeosols, Human/hominid remains, Archaeological sites - Zhoukoudian

Wei Qi

1986 The Pleistocene/Holocene Boundary in China. In *The Pleistocene Perspective, Volume 2.* Paper presented at the World Archaeological Congress. 13 pp. Allen and Unwin, Southampton, England.

In China, the emergence of Neolith markes [sic] the beginning of Holocene. But the engendering of Neolith did not mean the disappearing of Paleolith. Therefore the boundary demarcating between Pleistocene and Holocene is in the transitional stage from Paleolithic Age to Neolithic Age. This time began about 12,000 years ago.

Notes: Session: Adaptations to Rising Temperatures *c* 15,000 BP Onwards in East Asia.
Area: China
Topics: Climate history - China, Sea level changes, Archaeological sites - China, Archaeological sites - China - northern, Archaeological sites - Shiyu, Archaeological sites - Xiachuan, Archaeological sites - Hutouliang, Archaeological sites - Zhoukoudian, Archaeological sites - Djalai-nor, Lithics, Vegetation history - China, Human/hominid remains, Faunal extinction, Faunal associations, Faunal remains - China, Faunal remains - *Crocuta ultima*, Faunal remains - *Mammuthus sungari*, Faunal remains - *Coelodonta antiquitatis*, Faunal remains - *Bison exiguus*, Faunal remains - *Equus caballus*, Faunal remains - *Equus hemionus*, Faunal remains - *Palaeoloxodon namadicus*

1991 Geologic Sequence of the Archaeological Sites in the Nihewan Basin, North China. In *INQUA, 13th International Congress, Beijing, China, Abstracts*, p. 389.

Area: China - northern
Topics: Archaeological sites - China, Geoarchaeology

Wormington, H. M.

1977 Archeology of the Late and Post-Pleistocene from a New World Perspective. In *Paleoanthropology in the People's Republic of China*, edited by W. W. Howells and P. J. Tsuchitani, pp. 115-122. Committee on Scholarly Communication with the People's Republic of China (CSCPRC) Report No. 4. National Academy of Sciences, Washington, D.C.

Notes: A trip report of the American Paleoanthropology Delegation.
Location: AEU HSS GN 855 C6 A512
Area: China

Topics: Lithics, Lithic affinities, Archaeological sites - China, Archaeological sites - Shiyu, Archaeological sites - Zhoukoudian, Faunal remains

Wu Rukang

1983 Hominid Fossils from China and their Bearing on Human Evolution. Canadian Journal of Anthropology 3(2):207-212.

A general review of hominoid fossils found from China in recent years is presented in chronological sequence: *Ramapithecus* and *Sivapithecus*, *Homo erectus*, early *Homo sapiens*, and late *Homo sapiens*. Their bearing on human evolution is illustrated.

Location: AEU PMC GN 1 C22
Area: China
Topics: Human/hominid remains, Archaeological sites - China, Archaeological sites - Zhoukoudian, Hominid evolution

Wu Rukang, and Lin Shenglong

1985 Chinese Palaeoanthropology: Retrospect and Prospect. In *Palaeoanthropology and Palaeolithic Archaeology in the People's Republic of China*, edited by Wu Rukang and J. W. Olsen, pp. 1-27. Academic Press, Orlando, Florida.

Palaeoanthropological research in China, including the allied pursuits of Palaeolithic archaeology and the study of fossil apes and hominids, has taken its place in the mainstream of world palaeoanthropology. A combination of China's unique geographic location and abundant fossil and archaeological materials has allowed great strides to be taken in palaeoanthropological research over the course of the past few decades. This article presents a historical review of Chinese palaeoanthropological studies, as well as a delineation of some of the principal directions in which we foresee the field moving.

Notes: Abstract taken from introduction.
Location: AEU HSS GN 772.32 C6 P17
Area: China
Topics: Archaeological sites - China, Archaeological studies - China, Archaeological sites - Shiyu, Archaeological sites - Xiachuan, Archaeological sites - Hutouliang, Archaeological sites - Zhoukoudian, Human/hominid remains, Hominid evolution, Lithics, Faunal remains - *Coelodonta antiquitatis*, Cultural traditions

Wu Xinzhi

1986 Upper Palaeolithic Man in China and their Relation with Populations of Neighbouring Areas. In *The Pleistocene Perspective, Volume 1*. Paper presented at the World Archaeological Congress. 19 pp. Allen and Unwin, Southampton, England.

Notes: Session: Palaeoanthropology - Human Evolution: Later Hominids.
Area: China
Topics: Archaeological sites - Zhoukoudian, Archaeological sites - China - northern, Archaeological sites - Shiyu, Human/hominid remains, Hominid evolution, Dating - uranium series

Wu Xinzhi, and Wang Linghong

1985 Chronology in Chinese Palaeoanthropology. In *Palaeoanthropology and Palaeolithic Archaeology in the People's Republic of China*, edited by Wu Rukang and J. W. Olsen, pp. 29-51. Academic Press, Orlando, Florida.

In this chapter we have endeavored to provide both a history of chronometric dating in China as well as a summary of the more important absolute determinations as they pertain to the Pleistocene prehistory and palaeoanthropology of this region.

Although a great deal of room remains for improvement in the development and application of chronometric dating techniques in China, the data already derived have changed the face of anthropological research in this country in many important respects.

Biostatigraphic analyses and typological studies originally provided us with a relative chronological sequence for China's fossil hominids and Palaeolithic archaeological sites. Absolute dates have proven the original rough estimates are basically correct. In the future, biostratigraphy and typology will continue to be important factors in Chinese palaeoanthropological research, particularly in depositional contexts where chronometric techniques are not applicable or yield ambiguous results. When the strata of a single locality have been accumulated as a result of widely varying depositional processes and the associated faunal assemblages are equally divergent, chronological comparison becomes an especially difficult task. In contrast, chronometric dating provides a common measure applicable to a broad spectrum of depositional environments and, as a result, we believe these techniques will allow us to expand and refine previous accomplishments to meet the needs of anthropological research at a higher level in China.

Notes: Conclusion used as abstract.
Location: AEU HSS GN 772.32 C6 P17
Area: China
Topics: Archaeological sites - China, Archaeological sites - Zhoukoudian, Dating, Dating - uranium series, Dating - radiocarbon, Faunal remains, Faunal remains - *Bubalus wansjocki*, Faunal remains - *Megaloceros ordosianus*, Faunal remains - *Crocuta*, Faunal remains - *Coelodonta antiquitatis*, Human/hominid remains, Hominid evolution, Geoarchaeology, Archaeological sites - Mongolia, Archaeological sites - China - northern, Archaeological sites - Hutouliang, Archaeological sites - Xiachuan, Archaeological sites - Shiyu, Archaeological sites - Djalai-nor, Lithics, Plant macrofossils - peat, Plant macrofossils - wood

Wu Xinzhi, and Zhang Zhenbiao

1985 *Homo sapiens* Remains from Late Palaeolithic and Neolithic China. In *Palaeoanthropology and Palaeolithic Archaeology in the People's Republic of China*, edited by Wu Rukang and J. W. Olsen, pp. 107-133. Academic Press, Orlando, Florida.

Location: AEU HSS GN 772.32 C6 P17
Area: China
Topics: Archaeological sites - China, Archaeological sites - Shiyu, Archaeological sites - China - northern, Human/hominid remains, Hominid evolution, Archaeological sites - Zhoukoudian, Faunal associations, Faunal remains - *Crocuta crocuta ultima*, Faunal remains - *Acinonyx jubatus*, Faunal remains - *Panthera tigris*, Faunal remains - *Panthera pardus*, Faunal remains - *Equus hemionus*, Faunal remains - *Struthio anderssoni*

Yi, S., and G. A. Clark

1983 Observations on the Lower Palaeolithic of Northeast Asia. Current Anthropology 24:181-202.

The "chopper-chopping-tool tradition" proposed by Movius in 1948 as a characterization of Lower Palaeolithic assemblage variability in East Asia is here examined and rejected. It is argued that its uncritical acceptance in the Western literature has resulted in an inaccurate perception of technological variability and change in this vast region. A brief summary of recent primary source material clearly indicates (1) that there are variable quantities of "classic" Acheulian bifacial handaxes in some Korean, Chinese, and Mongolian Lower Palaeolithic assemblages and (2) that a dichotomous pattern of assemblage variability characterized by handaxes in the West and choppers/chopping tools in the East is an unrealistic and oversimplified schematization of the East Asian Palaeolithic, which rivals in its complexity of contemporaneous assemblages in the West.

A better approximation of the Northeast Asian Lower Palaeolithic is Jia and Wei's two-series hypothesis, based upon recent excavations at Zhoukoudian Locality 1, Shiyu, Dingcun, and Kehe. A major shortcoming is insufficient emphasis

on the shared features of the two series. It is suggested that more refined lithic typologies incorporating attributes of manufacture and use and quantitative assessments of overall assemblage composition will be required for better approximations of modal assemblage types in this region.

Location: AEU PMC GN 1 C97
Area: China, Siberia, Western Beringia, Japan, Korea
Topics: Archaeological studies - China, Archaeological sites - China, Archaeological sites - Korea, Archaeological sites - Japan, Archaeological sites - Shiyu, Archaeological sites - Zhoukoudian, Archaeological sites - Siberia, Lithics, Lithic affinities, Cultural traditions

You Yu-zhu

1985 Preliminary Study on Paleolithic Bone Engraving in Shiyu Shanxi Province. In *Quaternary Geology and Environment of China*, edited by Liu Tung-sheng, pp. 269-272. Quaternary Research Association of China, China Ocean Press, Beijing, China.

This article presents the analysis of carvine bone fragments found in Shiyu Site. The traces on the surface of bone fragments recorded hunting behavior and mode of thinking of Shiyu Man.

Notes: First published in China in 1982. Republished 1985 and distributed by Springer-Verlag, Berlin.
Location: AEU SCI QE 696 Q1197
Area: China - northern
Topics: Bone modification, Geoarchaeology, Archaeological sites - Shiyu, Lithics, Faunal remains - *Struthio*, Faunal remains - *Erinaceus*, Faunal remains - *Crocuta*, Faunal remains - *Panthera tigris*, Faunal remains - *Myospalax*, Faunal remains - *Cervus elaphus*, Faunal remains - *Megaloceros ordosianus*, Faunal remains - *Procapra picticaudata*, Faunal remains - *Gazella subgutturosa*, Faunal remains - *Bubalus wansjocki*, Faunal remains - *Bos*, Faunal remains - *Coelodonta antiquitatis*, Faunal remains - *Equus przewalskii*, Faunal remains - *Equus hemionus*

You Yu-Zhu, Xu Qi-Qin, Li Yi, and Ho Chuan-Kun

1986 Seasonality and Site Structure of Late Paleolithic Sites from Northeast China. Current Research in the Pleistocene 3:97-102.

At least 12 localities with fossil hominids, 17 lithic assemblages, and 140 Quaternary deposits with mammalian fossils were found during the 1970s in Manchuria. The geologic age of these localities is primarily mid-Pleistocene to early Holocene, but most are from the late Pleistocene. The earliest site has been dated to 330,000 yr B.P. by uranium series dating, the most recent one has been dated to 7,000 yr B.P. Cultural remains that indicate a cultural evolutionary sequence have also been found at these sites, and environmental reconstruction from the mammalian faunal assemblages indicate four evolutionary stages. These new finds from northeastern China will undoubtedly provide us with basic data for the research of hominid migration and cultural diffusion between East Asia and North America.

This paper will discuss in a preliminary fashion the seasonal occupation and site structure of two newly excavated late Paleolithic sites from northeastern China.

Notes: Abstract taken from introduction. Contains faunal lists.
Location: AEU HSS E 61 C97
Area: China - northeastern
Topics: Geoarchaeology, Lithics, Bone modification, Archaeological sites - China - northeastern, Archaeological sites - Shiyu, Faunal remains - China, Faunal remains - birds, Vegetation history - China, Human/hominid remains, Climate history - China, Dating - uranium series, Dating - radiocarbon

Yu Huili

1988 A Brief Study of Late Palaeolithic Localities at Xuetian Village of Wuchang County, Heilongjiang Province. Acta Anthropologica Sinica 7(3):255-262.

The present paper deals with a preliminary observation of two late paleolithic localities which are situated at Xuetian village of Wuchang County, Heilongjiang Province and were excavated in September 1986. Some human fossils, stone artifacts were found in one of them (H8601), while many mammalian fossils and some chipping bone artifacts were encountered in the localities (H8601 and H8602).

It is the first time that a fragmentary tibia of *Homo sapiens sapiens* was discovered in Heilongjiang Province.

Notes: Four plates follow p. 262.
Area: China - northeastern
Topics: Archaeological sites - China - northeastern, Human/hominid remains, Bone modification, Lithics, Geoarchaeology, Faunal remains - *Mammuthus sungari*, Faunal remains - *Mammuthus primigenius*, Faunal remains - *Myospalax*, Faunal remains - *Equus przewalskii*, Faunal remains - *Cervus*, Faunal remains - *Bison*, Faunal remains - *Coelodonta antiquitatis*
Language: Chinese with English abstract on p. 262.

Zhang Zhen-Hong, and Chen Chun
1986 Two Earliest Paleolithic Sites in Northeast China. Current Research in the Pleistocene 3:102-107.

Location: AEU HSS E 61 C97
Area: China - northeastern
Topics: Human/hominid remains, Archaeological sites - China - northeastern, Lithics, Dating - uranium series, Dating - radiocarbon
Language: English with Chinese translation on pp. 104-107.

Zhang Zhenhong, Fu Renyi, Chen Baofeng, Liu Jingyu, Zhu Mingye, Wu Hongkuan, and Huang Weiwen
1985 A Preliminary Report on the Excavation of Paleolithic Site at Xiaogushan of Haicheng, Liaoning Province. Acta Anthropologica Sinica 4(1):70-79.

Xiaogushan cave site was first found in 1981 and a test excavation was taken in the same year. Then, a systematic excavation was carried out in the summer, 1983. Numerous mammalian fossils, some human fossils and abundant, varied cultural remains were encountered during the excavation. The present paper only gives a preliminary observation of the site and a brief study of the materials.

The site (40°34'53"N, 122°58'30"E) is situated at the north of Liaodong Peninsula in Northeast China, more then [sic] 120 km away from Shenyang. The fossiliferous deposits are in a marble cave and its floor is about 1 meter high above the present river bed. The deposit is about 6 meters in depth. Its top consists of black-brown soil mixed with angular marble fragments. This layer is 0.7 meter in maximum depth and its age belongs to Holocene. The lower part of the deposit consists of brown and yellow-brown gravel, sand, clay, soil and angular marble fragments. It can be divided into 4 layers, more than 5 meters in total thickness. The mammalian fossils, human fossils and cultural remains, all of Pleistocene, were discovered in these layers. ...

The preliminary observation indicated that the age of Xiaogushan site can be attributed to Late Pleistocene based on mammalian fauna, and taken as a whole, the Xiaogushan Culture exhibits strong features, from which it can clearly be ranged within the Upper Paleolithic age.

Notes: Part of summary used as abstract. Two plates follow p. 79.
Area: China - northeastern
Topics: Faunal remains - *Canis*, Faunal remains - *Vulpes corsac*, Faunal remains - *Ursus*, Faunal remains - *Crocuta ultima*, Faunal remains - *Mammuthus primigenius*, Faunal remains - *Equus przewalskii*, Faunal remains - *Coelodonta antiquitatis*, Faunal remains - *Gazella przewalskii*, Faunal remains - *Bison*, Faunal remains - *Bubalus*, Faunal remains - *Cervus canadensis*, Faunal remains - *Megaloceros ordosianus*, Faunal remains - *Sus scrofa*, Archaeological sites - China - northeastern, Lithics, Bone modification, Stratigraphy
Language: Chinese with English summary on pp. 78-79.

PART 6. MODERN BIOGEOGRAPHY

Barnes, B. V., and F. Han

1993 Phenotypic Variation of Chinese Aspens and their Relationships to Similar Taxa in Europe and North America. Canadian Journal of Botany 71:799-815.

Morphological variation of leaves and pubescence of buds and shoots from Chinese aspen taxa (sect. *Populus* of *Populus*) were studied and compared with those of North American aspens. Data were analyzed for 648 clones from 19 Provinces of Chinese aspen taxa identified on herbarium specimens as *P. bonatii* Gomb., *P. davidiana* Dode, *P. rotundifolia* Griff. var. *bonatii* Gomb., *P. rotundifolia* Griff. var. *duclouxiana* (Dode) Gomb., and *P. tremula* L. In addition, data from field collections of intact shoots of 137 clones of *P. davidiana* (Heilongjiang, Jilin, and Shaanxi Provinces) and from 821 clones of *P. tremula* from Europe were also analyzed. Leaf morphology of herbarium specimens identified as *P. davidiana*, the most widely distributed Chinese taxon, varied markedly among populations, especially between northern and southwestern China. Clones of *P. davidiana* from northern and northwestern China were markedly different from those of the *P. rotundifolia* complex of southwestern China. However, clones identified as *P. davidiana* from southwestern China were similar to those of *P. rotundifolia* in leaf shape, number of teeth, and pubescence; they differed only in leaf size. Striking within- and among-population differences were found for field collections of *P. davidiana* in northeast China. Buds and seasonally determinate shoots of *P. davidiana* were glabrous in northeast and north-central China; pubescence increased markedly to the southwest. Buds and shoots of clones of the *P. rotundifolia* complex and *P. tremula* were predominantly pubescent. The Eurasian aspen taxa are enormously polymorphic in leaf morphology and pubescence; clinal variation along geographic gradients in China, Japan, and Europe are pronounced. Based on studies to date, we would tend to recognize *P. davidiana* and *P. rotundifolia* as races of *P. tremula*. It may be that in all of Eurasia there is but a single, highly polymorphic species, viz. *P. tremula*.

Location: AEU SCI QK 1 C21
Area: China, China - northeastern, China - north-central
Topics: Modern biogeography - China, Biogeography - *Populus*

Li Xiwen, Sun Xiangjun, and D. Walker

1984 The Potential for Palaeobotany in the Explanation of China's Plant Geography. In *The Evolution of the East Asian Environment, Volume II, Palaeobotany, Palaeozoology and Palaeoanthropology*, edited by R. O. Whyte, pp. 433-447. Centre of Asian Studies, University of Hong Kong, Hong Kong.

Area: China
Topics: Vegetation history - China, Pollen records - China, Modern biogeography - China

Whyte, R. O.

1984 The Gramineae in the Palaeoenvironment of East Asia. In *The Evolution of the East Asian Environment, Volume I, Geology and Palaeoclimatology*, edited by R. O. Whyte, pp. 622-650. Centre of Asian Studies, University of Hong Kong, Hong Kong.

Area: China
Topics: Vegetation history - China, Biogeography - Gramineae, Modern biogeography - China

SECTION E. NORTHERN JAPAN

PART 1. GENERAL

Reynolds, T. E. G., and S. C. Kaner

1990 Japan and Korea at 18 000 BP. In *The World at 18 000 BP, Volume 1, High Latitudes*, edited by O. Soffer and C. Gamble, pp. 296-311. Unwin Hyman, London, England.

The record of the LGM in Japan and Korea shows this area to have been subject to increasingly intensive use as indicated by site numbers, tool types, and site complexity. These are particularly well documented in the Kanto region of Japan. The effects of climatic changes and altered sea-levels on prehistoric occupation are to some extent masked by the lack of faunal materials and current lack of archaeological use of palaeoenvironmental reconstruction, but this situation is changing and the Japan Sea region will be an important area for studying the nature of prehistoric hunter-gatherer adaptations in response to changing geography and climate, particularly as it lies in the path of routes of colonization for the Americas.

Notes: Conclusions used as abstract.
Location: AEU HSS GN 741 W928
Area: Japan, Japan - Hokkaido, Korea
Topics: Vegetation history, Pollen records, Treeline fluctuations, Climate history, Sea level changes, Archaeological sites - Japan, Archaeological sites - Japan - Hokkaido, Archaeological sites - Korea, Geoarchaeology, Loess, Palaeosols, Lithics, Lithic affinities, Faunal remains

PART 2. LATE QUATERNARY GEOLOGY

Fujiwara, Y., and S. Okada

1979 Paleomagnetic Stratigraphy of Volcanic Products in Southwestern Hokkaido, Japan. Journal of the Faculty of Science, Hokkaido University, Series IV: Geology and Mineralogy 19(1-2):189-198.

A paleomagnetic study was made on 149 specimens from 31 sites on Pleistocene volcanic products developing in southwestern Hokkaido. Of them, two pyroclastic flows and one lava flow are reversely magnetized. The boundary between the Bruhnes normal and the Matuyama reversed epochs probably took place sometime during the eruption of volcanic products developing around the Toya and also Shikotsu Caldera in southwestern Hokkaido, North Japan.

Location: AEU SCI QE 1 H72
Area: Japan - Hokkaido
Topics: Stratigraphy, Tephra - Japan, Dating, Palaeomagnetism

Horie, S.

1957 A Topographic Study of Lacustrine Terraces and Crustal Movements around Lake Kutcharo, Hokkaido. Japanese Journal of Geology and Geography 28:1-10.

Starting from the southern region of Kamchatka Peninsula, the Chishima Volcanic Zone runs from northeast to southwest along the Kurile Islands and extends to as far south as Hokkaido. In the eastern and central parts of Hokkaido, there are many prominent volcanoes. ... Also conspicuous is the presence of many lakes related to the volcanic activities in this zone. ... Among them, Lake Kutcharo is the largest with the area of 77.5 sq. km. and is located at 121m. above the sea level. ... the lake basin of Kutcharo is one of the largest calderas in the world, ... This caldera depression was formed during the Later Pleistocene ...

During the summer of 1954, the writer, after an extensive survey around Lake Kutcharo, found three lacustrine terraces, indicating notable crustal movements.

Notes: Abstract modified from introduction.
Location: AEU SCI QE 1 J35
Area: Japan - Hokkaido
Topics: Stratigraphy, Tectonism, Diatoms

1986 Glacial Stratigraphy in Japan. Quaternary Science Reviews 5:485-488.

Notes: Special volume, *Quaternary Glaciations of the Northern Hemisphere*, edited by V. Sibrava, D. Q. Bowen, and G. M. Richmond. Report of IGCP Project 24.
Location: AEU SCI QE 696 Q245
Area: Japan - Hokkaido
Topics: Review of glacial history - Japan

Inoue, K., and T. Naruse

1991 Accumulation of Asian Long-Range Eolian Dust in Japan and Korea from the Late Pleistocene to the Holocene. Catena Supplement 20:25-42.

Long-range, tropospheric eolian dust transported from the Asian continent has been deposited on the land in Japan and Korea and on the sea floor of the Sea of Japan and the North Pacific Ocean since the Late Pleistocene. ... Red-Yellow soils formed on Quaternary coral and Paleozoic limestones and basalts in Japan and Korea and the paleosols buried in paleodunes along the coast of the Sea of Japan are composed predominantly of weathered eolian dust deposits. ... The median particle diameters of loess in the Loess Plateau in China, loess-derived soils, eolian dust deposits, and pelagic sediments decrease steadily from the eastern part of China through Japan and Korea (3 to 20 μm) to Hawaii and the North Pacific Ocean (0.7 to 8 μm). ... Oxygen isotope compositions (δO^{18}) of fine grained quartz (1 to 10 μM) from sample soils and eolian dust deposits in Japan, Korea and the Sea of Japan pelagic sediments ... [indicate] ... that it is of Asian continental origin. The recent flux of Asian eolian dust is about 4 to 7 mm/1,000 years, compared to about 14 to 23 mm/1,000 years in the Late Pleistocene cold periods. Acids in acid rain and snow are partially neutralized by calcite

contained in the long-range eolian dust. These results indicate that Asian long-range eolian dust should receive close attention in our efforts to understand the pedogenesis processes and the properties of various kinds of soils in Japan and Korea and also the transport and ultimate destination of acids in terrestrial and aquatic environments in East Asia.

Notes: Summary adapted for abstract.
Location: AEU SCI QE 579 L826
Area: Japan, Korea
Topics: Loess, Loess - geochemistry, Mineralogy, Stable isotopes - $\delta^{18}O$, Palaeowinds, Palaeosols, Sedimentology - loess, Tephra

Kaizuka, S., Y. Naruse, and I. Matsuda
1977 Recent Formations and their Basal Topography in and around Tokyo Bay, Central Japan. Quaternary Research 8:32-50.

This paper summarizes the subsurface geology of the recent (both Holocene and latest Pleistocene) formations and the buried topography beneath them in and around Tokyo Bay, the type area of the late Quaternary in Japan. Buried abrasion platforms in the buried topography are classified into upper (ca. 0 to -10 m high) and lower (ca. -20 to -40 m) platforms: upper and lower buried river terraces are also distinguished, and are correlated to the subaerial late Pleistocene terraces of Tc_1 and Tc_2, respectively. A buried valley system is elucidated, of which the trunk valley floor reaches -70 m in Tokyo and emerges into a flat surface at the shelf edge in the entrance to Tokyo Bay. Approximate dates for these geomorphic surfaces are given. The height of sea level contemporaneous with the buried valley floor (ca. 20,000-15,000 yr BP) is estimated at about -135 m. The recent formations are divided into two members, upper and lower, by a middle sand bed, in addition to the lowest buried valley floor gravel. The lower member, which is composed of brackish to marine deposits of complicated lithofacies, was accumulated in narrow drowned valleys during the early stage of the Yurakucho (Flandrian) transgression. The middle sand bed is the foreset bed of deltas, which was formed during a slight regression between ca. 11,000 and 10,000 yr BP. The upper member, which consists mainly of widespread homogeneous marine clay and deltaic sand, was accumulated in a wide bay and its embayments during the late stage of the Yurakucho transgression and the following stage of a relatively stable sea level.

Location: AEU SCI QE 696 Q24
Area: Japan
Topics: Ocean cores, Stratigraphy, Sea level changes, Palaeochannels, Pollen records - Japan, Tephra - Japan, Palaeosols

Kashiwaya, K., A. Yamamoto, and K. Fukuyama
1988 Statistical Analysis of Grain Size Distribution in Pleistocene Sediments from Lake Biwa, Japan. Quaternary Research 30:12-18.

Time series of grain-size distributions from Pleistocene sediments deposited in Lake Biwa during the last 550 millennia show dominant periods of 40,000 and 20,000 yr that are very close to those predicted by the Milankovitch theory, as well as a period of about 70,000 yr not directly predicted by this theory. The 70,000-yr period is strongest, followed by the 20,000-yr period. The sequences also show that coarser particles were deposited, in general, during strong solar insolation, whereas finer particles were deposited during weak insolation.

Location: AEU SCI QE 696 Q24
Area: Japan
Topics: Palynological sites - Lake Biwa, Climate history - Japan, Sedimentology - lakes

Kozima, N.
1972 Sedimentation of the Pleistocene Upper Narita Group in Northern Tiba Prefecture, Japan - With Special Reference to the Bimodal Sand of the Kami-iwahasi Sand Member -. Japanese Journal of Geology and Geography 42:43-60.

The Kami-iwahasi Sand Member in the Narita Group appears to be composed of continuous sand layers from lower to upper part. By the grain size-, grain shape- and mineral-analyses, it is indicated that this sand member is a product of the sedimentation of two sorts of sand, which have been supplied from different sources.

Location: AEU SCI QE 1 J35
Area: Japan
Topics: Sedimentology, Stratigraphy

Manabe, K. I.

1977 Reversed Magnetozone in the Late Pleistocene Sediments from the Pacific Coast of Odaka, Northeast Japan. Quaternary Research 7:372-379.

Paleomagnetic measurements have been carried out on 103 specimens taken at about 15 cm intervals in a sea cliff exposing the marine terrace formation. Secondary components were removed by partial demagnetization in a peak field of 200 Oe. Two short reversed magnetozones are recognized. Geological and biostratigraphical evidence indicates that they are equivalent to the Blake event, which was first reported by Smith and Foster (1969) (Science **163**, 565-567) from the North Atlantic deep-sea cores. The present result suggests a split nature for the Blake Event.

Location: AEU SCI QE 696 Q24
Area: Japan
Topics: Sea level changes, Molluscs, Stratigraphy, Palaeomagnetism, Plant macrofossils, Tephra - Japan

PART 2. LATE QUATERNARY PALAEOENVIRONMENTS

Fuji, N.

1988 Palaeovegetation and Palaeoclimate Changes around Lake Biwa, Japan During the Last ca. 3 Million Years. Quaternary Science Reviews 7:21-28.

The palaeovegetation and palaeoclimate history in and around the lake during the last 3 Ma based on pollen analyses of the upper 900 m of a 1400-m core is presented, and a provisional global correlation made. The upper 900 m of the core is subdivided into 37 pollen zones. During glacial stages or stadials, vegetation typical of the subpolar zone occurred in the mountainous area around Lake Biwa, while in the lowland area, around the lake, plants characteristic of the cool temperate zone occurred. During interglacial stages or interstadials, the vegetation of the mountainous area was generally characterized by plants of the temperate zone and/or cool temperate zone, while in the lowland area, the vegetation was composed mainly of broadleaved deciduous and evergreen trees of the temperate and warm temperate zones. The climatic history of the last 500 ka shows remarkable parallels with the palaeotemperature record of the Caribbean and Pacific Oceans, sedimentary cycles of the Mediterranean Sea, environmental change in Central Europe, and the record of sea level change in Japan and New Guinea.

Location: AEU SCI QE 696 Q245
Area: Japan
Topics: Sea level changes, Stratigraphy, Lake cores, Tephra - Japan, Pollen analysis - modern pollen spectra, Loess, Palynological sites - Lake Biwa, Stable isotopes - $\delta^{18}O$, Climate history - Japan, Pollen analysis - Japan, Vegetation history - Japan

Heusser, L. E., J. J. Morley, and T. Sarro

1986 Paleoenvironments of Central Japan and the Sea of Japan for the Past 80,000 Years: Pollen and Radiolarian Data from Cores V28-265 and RC12-379. In *AMQUA, 9th Biennial Meeting, Champaign, Illinois, Program and Abstracts*, p. 86.

Location: AEU HSS QE 696 A5212
Area: Japan, Japan - Sea of Japan
Topics: Ocean cores, Pollen analysis - Japan, Radiolaria, Climate history - Japan

Hoshiai, M., and K. Kobayashi

1957 A Theoretical Discussion on the So-called "Snow Line", with Reference to the Temperature Reduction During the Last Glacial Age in Japan. Japanese Journal of Geology and Geography 28:61-75.

Although the local meteorological conditions control the snow line, the well-known postulate that the level of the snow line is ought [sic] to be nearly identical with the mean level of 0°C-isotherm for summer months, has been authorized by not a few authors. We discuss theoretically the isotherm corresponding to the snow line and emphasize that temperature value of the isotherm is not the same at any places.

The present and past snow line over the Japan Alps are discussed and the temperature reduction for summer during the glacial age in Central Japan is estimated.

Location: AEU SCI QE 1 J35
Area: Japan
Topics: Climate reconstruction, Ice limit reconstruction, Climate history - Japan

Igarashi, Y.

1991 Vegetation and Climate During the Maximum Stage in the Last Glacial Age of Hokkaido, Northern Japan. In *INQUA, 13th International Congress, Beijing, China, Abstracts*, p. 145.

Area: Japan - Hokkaido
Topics: Modern biogeography, Vegetation history - Japan, Climate history - Japan

Kotani, Y.

1969 Upper Pleistocene and Holocene Environmental Conditions in Japan. Arctic Anthropology 5(2):133–158.

Location: AEU PMC GN 1 A68
Area: Japan
Topics: Plant macrofossils - peat, Faunal remains - fish, Review of stratigraphy - Japan, Review of vegetation history - Japan, Review of climate history - Japan, Review of faunal assemblages - Japan, Tephra - Japan, Pollen records - Japan, Dating - analysis of radiocarbon dates, Molluscs - marine, Sea level changes

Meyers, P. A., K. Takemura, and S. Horie

1993 Reinterpretation of Late Quaternary Sediment Chronology of Lake Biwa, Japan, from Correlation with Marine Glacial-Interglacial Cycles. Quaternary Research 39:154-162.

A review of published stratigraphic records of pollen, sediment grain size, diatoms, and organic matter composition from Lake Biwa, Japan, identifies four pre-Holocene episodes of milder climate, increased surface runoff, and enhanced aquatic productivity, indicating intervals of warmer and wetter conditions which are interpreted as being interglacial. Correlation of these episodes to times of marine interglacial periods revises the age scale of the Lake Biwa sediment sequence which has been based on fission-tack dating. The revised chronostratigraphic scale proposes an age of ca. 430,000 yr B.P. for the base of the 250-m-thick T Bed instead of the former age of ca. 700,000 yr B.P.

Location: AEU SCI QE 696 Q24
Area: Japan
Topics: Palynological sites - Lake Biwa, Review of pollen analyses - Lake Biwa, Tephra - Japan, Climate history, Review of vegetation history - Lake Biwa, Review of stratigraphy - Lake Biwa, Tephra - Japan, Tephra - fission track dating, Tectonism, Dating - fission track, Diatoms, Sedimentology, Geochemistry, Stable isotopes - $\delta^{13}C$, Lake cores, Palaeomagnetism

Takagi, T.

1986 On Some *Dosinia* from the Pliocene and Pleistocene Formations in Hokkaido, Japan. Journal of the Faculty of Science, Hokkaido University, Series IV: Geology and Mineralogy 21:599-617.

Examination of many collections of Plio-Pleistocene dosinids from Hokkaido reveals that a new distinct species, *Dosinia tomikawensis*, described herein, has been lumped together with *D. tatunokutiensis* or *D. japonica*. *D. tomikawensis* is distinguished from *D. tatunokutiensis* and *D. japonica* by an obscure escutcheon and a rather long ligament. These three species are not known to co-occur, and they may each have different stratigraphic and paleozoogeographic ranges. *D. tomikawensis* occurs in the Pliocene deposits of (1) the Horokaoshirarika Formation, Tikikawa, central Hokkaido, (2) the Yuchi Formation, Teshio, northern Hokkaido, (3) the Atsuga Formation, Hidaka Monbetsu, southern part of central Hokkaido, (4) the Togawa Formation, Aomori, and (5) the Maruyama and the Nutov Formations in southern Sakhalin, and in the provincial Pleistocene deposits of (1) the Tomikawa Formation, Hakodate, southwestern Hokkaido, (2) the "upper Yuchi Formation" and the Sarabetsu Formation, Tenpoku, northern Hokkaido, and (3) the Omma Formation, Kanazawa, Ishikawa Prefecture. The occurrence of this species may suggest that this species retreated south- and westward from the adjacent waters of Sakhalin to the present northern-most limits within the warm Tsushima Current with the water temperature deterioration during the lapse of Pliocene to Pleistocene.

Location: AEU SCI QE 1 H72
Area: Japan - Hokkaido, Siberia - southeastern
Topics: Biogeography - molluscs, Taxonomy - molluscs, Molluscs - *Dosinia japonica*

Tsukada, M.

1983 Vegetation and Climate During the Last Glacial Maximum in Japan. Quaternary Research 19:212–235.

The Japanese Archipelago was almost entirely covered by coniferous forests during the last glacial maximum. Northern Hokkaido was distinguished by coniferous parkland and tundra vegetation, while southern Hokkaido and northernmost Honshu were covered by northern boreal coniferous forests consisting mainly of *Picea jezoensis*, *Picea glehnii*, *Abies sachalinensis*, and *Larix gmelinii*; *Tsuga* was missing from the forest. More diverse boreal forests including species from Sakhalin and northern Japan grew together in northeastern Honshu. Central Honshu and the mountains of southwestern Japan supported subalpine coniferous forests which are now mainly restricted in distribution to the central mountains. Temperate coniferous forests (*Picea polita*, *Abies firma*, and *Tsuga sieboldii*) existed principally in the modern mid-temperate and evergreen laurel-oak forest regions. *Haploxylon* pine and tree birch were also abundant in the boreal and cool-temperate zones, as was *Diploxylon* in the southern temperate zone. Significant populations of *Fagus* were found along the Pacific coasts of Kyushu and Shikoku, but they were too small to be defined as a beech forest zone. Quercetum mixtum (*Quercus*, *Ulmus*, and *Tilia*) was more common in the coastal lowlands of southwestern Japan than those of northeastern Honshu; it was completely eliminated from Hokkaido. The reduced mean August temperature inferred from the floral assemblages showed a latitudinal gradient 20,000 yr ago; it was 8-9°C in northern Hokkaido, 7.7-8.7°C in northernmost Honshu, 7.2-8.4°C in the central mountains, 6.5°C in the Chugoku District, and 5-6°C in Kyushu. The probable annual precipitation ranged from 1050 to 1300 mm along coasts in southwestern Japan during the culmination of the last glaciation.

Location: AEU SCI QE 696 Q24
Area: Japan
Topics: Pollen records - Japan, Climate reconstruction, Review of pollen analyses - Japan, Review of vegetation history - Japan, Review of climate history - Japan

1985 Map of Vegetation During the Last Glacial Maximum in Japan. Quaternary Research 23:369-381.

A vegetation map reconstructed for the Japanese Archipelago (based upon pollen data from 28 sites and plant macrofossil data from 33 sites) at the time of last glacial maximum shows that coniferous forests covered extensive areas of the land. Boreal conifer forests (dominated by the *Picea jezoensis* complex, *P. glehnii*, *Abies sachalinensis*, *A. mariesii*, *Tsuga diversifolia*, and *Pinus* with *Larix gmelinii*, though the latter species was confined only to the northern part of the northeastern Honshu and Hokkaido) occupied the modern cool-temperature deciduous broadleaf and mid-temperate conifer forest zones, and temperate coniferous forests (mainly *Picea maximowiczii*, *P. polita*, *P. bicolor*, *P. koyamai*, *Abies firma*, *A. homolepis*, *Tsuga sieboldii*, and *Pinus*), the present warm-temperate evergreen (laurilignosa) forest zone. Small populations of various broadleaf forest species were scattered in the full-glacial temperate conifer forest mainly along the coastal belt, and the true laurilignosa forest was limited in distribution, occurring only in the paleo-Yaku Peninsula.

Location: AEU SCI QE 696 Q24
Area: Japan
Topics: Plant macrofossils, Pollen records - Japan, Review of vegetation history - Japan, Climate history - Japan

1986 Vegetation in Prehistoric Japan: The Last 20,000 Years. In *Windows on the Japanese Past: Studies in Archaeology and Prehistory*, edited by R. J. Pearson, G. L. Barnes and K. L. Hutterer, pp. 11-56. Centre for Japanese Studies, University of Michigan, Ann Arbor, Michigan.

During the last glacial maximum (25,000-15,000 B.P.), mountain glaciers developed only on the high peaks of central Honshu and Hokkaido, and various coniferous forests dominated almost the entire Japanese archipelago. The modern laurilignosa forest region was occupied by temperate coniferous forests (mainly *Abies firma*, *A. homolepsis*, *Picea maximowiczii*, *P. polita*, *Tsuga sieboldii*, and the *Pinus parva* complex). Conifer species of Sakhalin (*Larix gmelinii*) and Hokkaido (*Picea jezoensis*, *P. glehnii*, and *Abies sachalinensis*) extended as far south as the Hanaizumi site (38°51' north latitude). Most of the subalpine conifers did not expand northward, but may possibly have moved to the mountains in southwestern Honshu.

Species of Fagaceae, which had an abundant production of edible acorns and nuts, were very limited both in population size and distribution during full- and late-glacial times. *Cyclobalanopsis* and *Castanopsis* escaped to the southern coasts of Kyushu and Shikoku, and deciduous oak and beech sporadically remained as far north as 38° north latitude along coasts of the archipelago. Dense beech populations were restricted to the Pacific coast in Kyushu.

Based on vegetation changes, the boundary between the Pleistocene and the Holocene, or the late-glacial/postglacial, in Japan is set at 10,000 ^{14}C years B.P. In the middle of late-glacial zone L (15,000-10,000 B.P.), *Fagus*, which had grown south of 38° north latitude during the preceding glacial maximum, began to increase around 12,000 B.P. The initial increase in *Fagus* divides the late-glacial into two zones, LI (15,000-12,000 B.P.) and LII (12,000-10,000 B.P.)

The early postglacial period (RI) is a stage of vegetation transition from the late-glacial to mid-postglacial periods. Because the forests were unstable in southwestern Japan during R1 time, an abundance of pioneer taxa, *Celtis/Aphananthe*, *Artemisia*, *Pteridium aquilinum*, among others, was seen. This zone is subdivided into RIa (10,000-8500 B.P.) and RIb (8500-7000 B.P.). In the lowlands of Kyushu, although *Fagus* disappeared by 10,000 B.P., there is no conspicuous marker plant to delineate the RIa/RIb boundary. In southwestern Honshu, *Fagus* and other deciduous broadleaf forest species persisted until the end of RIb. The RIa/RIb boundary is set at the time of the beginning of the slow increase of the laurilignosa species in southwestern Honshu, of the initial rise of *Lepidobalanus* and *Fagus*, and the substantial fall of *Betula* in northernmost Honshu, and of the spruce decline and *Ulmus* rise in Hokkaido. No significant change is seen in central Japan for this boundary since the postglacial vegetation was already established during LII time. ...

Notes: Part of conclusions used as abstract.
Location: AEU HSS GN 855 J2 W765, AEA PMA/ASA 915.203 W724
Area: Japan
Topics: Review of pollen analyses - Japan, Pollen records - Japan, Pollen analysis - Japan, Review of vegetation history - Japan, Sea level changes

1986 Altitudinal and Latitudinal Migration of *Cryptomeria japonica* for the Past 20,000 Years in Japan. Quaternary Research 26:135-152.

Biostatistical analysis of modern pollen assemblages in 152 Japanese surface samples shows that *Cryptomeria japonica* can normally grow in areas with a mean January temperature of approximately -7° to 7°C, a mean August temperature of 19° to 27°C, and an effective precipitation (total precipitation during the growing season) of over 1000 mm. The full-glacial distribution of the species on both the Sea of Japan and the Pacific coasts (35-36°N lat) indicates that in these areas the maximum possible reduction of temperature was 8.7-10.2°C in January and 6.0-7.3°C in August, and that the effective precipitation was low, being 1000-1350 mm, or 40-55% below the modern level, provided that the species has not changed its physiological characteristics. Populations of *C. japonica* expanded northward and upslope from their full-glacial areas of distribution immediately after late-glacial climatic amelioration. This expansion appears to have been regulated mainly by the availability of effective precipitation which became high in northeastern Honshu about 4000 yr ago. After about 2500 yr B.P., *C japonica* was planted extensively by humans in moist, temperate climatic regions (excluding Hokkaido), and now has its widest distribution since at least the last full-glacial interval.

Location: AEU SCI QE 696 Q24
Area: Japan
Topics: Biogeography - *Cryptomeria japonica*, Vegetation history - *Cryptomeria japonica*, Pollen analysis - Japan, Pollen analysis - modern pollen spectra, Plant macrofossils - peat, Plant migration, Climate history - Japan

1988 Japan. In *Vegetation History*, edited by B. Huntley and T. Webb III, pp. 459-518. Handbook of Vegetation Science Volume 7. Kluwer Academic Publishers, Dordrecht, The Netherlands.

Location: AEU SCI QK 48 H23
Area: Japan
Topics: Pollen analysis - modern pollen spectra, Pollen records - Japan, Tephra - Japan, Review of vegetation history - Japan, Review of pollen analyses - Japan

Tsukada, M., and S. Sugita

1982 Coniferous Forests During the Last Glacial Maximum Period in Japan. In *AMQUA, 7th Biennial Meeting, Seattle, Washington, Program and Abstracts*, p. 168.

Location: AEU HSS QE 696 A5212
Area: Japan
Topics: Vegetation history - Japan, Pollen records - Japan

PART 3. LATE QUATERNARY PALAEONTOLOGY

Kawamura, Y.

1991 Late Pleistocene to Holocene Mammalian Faunal Succession in the Japanese Islands, with Comments on the Late Quaternary Extinctions. In *INQUA, 13th International Congress, Beijing, China, Abstracts*, p. 160.

Area: Japan
Topics: Faunal associations, Faunal migration, Faunal extinction, Faunal remains - Japan

Minato, M.

1955 Zu Den Mammonteusfaunen Hokkaidos. Japanese Journal of Geology and Geography 26:105-113.

Location: AEU SCI QE 1 J35
Area: Japan - Hokkaido
Topics: Faunal remains - *Mammonteus primigenius*
Language: German

Sawamura, H.

1991 The Fauna and its Mode of Occurence [sic] at the Nojiri-ko Site, Late Pleistocene, Japan. In *INQUA, 13th International Congress, Beijing, China, Abstracts*, p. 316.

Notes: Abstract coauthored by the Nojiri-ko Excavation Research Group.
Area: Japan
Topics: Faunal remains - *Palaeoloxodon naumanni*, Faunal remains - *Sinomegaceros yabei*, Faunal remains - *Cervus nippon*, Faunal remains - *Ursus arctos*, Faunal remains - *Lepus*, Faunal remains - *Microtus*, Faunal remains - *Apodemus argenteus*, Faunal remains - birds, Bone modification, Lithics, Human/hominid remains

Takai, F. (Compiler)

1962 *Bibliography of Japanese Palaeontology and Related Sciences: 1951-1960.* Palaeontological Society of Japan Special Papers Number 9. Palaeontological Society of Japan, Tokyo, Japan. 338 pp.

Notes: Volume compiled and edited with collaboration of T. Kobayashi, T. Hanai, and T. Sato. Volume organized by author and by subject. Broad temporal and geographic coverage.
Location: AEU SCI QE 756 J3 Z9 B58
Area: Japan
Topics: Bibliography - Japanese palaeontology, Palaeontology

PART 4. ARCHAEOLOGY AND HUMAN HISTORY

Aikens, C. M., and T. Higuchi
1982 ***Prehistory of Japan.*** **Academic Press, New York, New York. xv + 354 pp.**

Notes: See especially Chapter 2: The Paleolithic Period (pp. 25-94). A comprehensive review of the Japanese palaeolithic.
Location: AEU HSS GN 855 J2 A29
Area: Japan, Japan - Hokkaido
Topics: Sea level changes, Faunal remains, Faunal remains - *Megacervus*, Faunal remains - *Mammuthus primigenius*, Faunal migration, Archaeological sites - Japan, Archaeological sites - Japan - Hokkaido, Geoarchaeology, Vegetation history - Japan, Climate history - Japan, Tephra - Japan, Palaeosols, Lithics, Dating - obsidian hydration, Modern biogeography, Review of archaeology - Japan

Befu, H., and C. S. Chard
1960 Preceramic Cultures in Japan. American Anthropologist 62:815-849.

Location: AEU PMC GN 1 A51
Area: Japan, Japan - Hokkaido
Topics: Archaeological studies - Japan, Lithics, Archaeological sites - Japan, Archaeological sites - Japan - Hokkaido, Geoarchaeology, Tephra - Japan, Lithic affinities

Befu, H., C. S. Chard, and A. Okada
1964 An Annotated Bibliography of the Preceramic Archaeology of Japan. Arctic Anthropology 2(1):1-83.

Location: AEU PMC GN 1 A68
Area: Japan
Topics: Bibliography - Japanese archaeology, Archaeological sites - Japan, Lithics, Geoarchaeology, Faunal remains - Japan, Plant macrofossils

Hayashi, K.
1968 The Fukui Microblade Technology and its Relationships in Northeast Asia and North America. Arctic Anthropology 5(1):128-190.

Location: AEU PMC GN 1 A68
Area: Japan, Western Beringia, Eastern Beringia, Kamchatka
Topics: Archaeological sites - Japan, Lithics, Lithic affinities, Cultural traditions, Archaeological sites - Lake Ushki, Archaeological sites - Anangula

Ikawa, F.
1957 Non-Ceramic Culture in Japan. Davidson Journal of Anthropology 3(2):1-23.

The hand-axe industry seems to have appeared earliest in Japan. The resemblance of Japanese hand-axes in form and technique to those outside of Japan has been pointed out by some workers, but no definite relationship can yet be established. The blade industry seems to have followed the hand-axe. Within the blade industry, the sub-group which produced the flake-blades would not necessarily indicate the arrival of a new group, but could be continuation from the previous industry only without the hand-axe. The northern distribution of the sub-group with true blade technique, including burins, could be interpreted as the result of the arrival of new people via the northern route. The fact that Japan was still a part of the continent at this time is shown by the Mammoth teeth recently found in Hokkaido, which are dated a little later than the blade-industry sites in the same area. The technique of producing blades with steeply retouched edges may have existed at a fairly early date, as the earlier form occurs at the site of the blade industry below the unretouched blades. A developmental series out of this prototype might have taken place mainly in the Kanto Area, where the scarcity

of raw material may have encouraged the production of smaller tools. Progressive reduction in size might have resulted in the production of the so-called 'geometric microliths', and in this form, they spread westward to the Inland Sea Area. The demonstrated gradation of point types seems to indicate the indigenous development of points out of the retouched blades, although the introduction of the new technology can not be dismissed. But the micro-blade industry, which appears as the final phase of the non-ceramic period, and which has a wide distribution throughout Northeastern and Central Asia to Alaska, seems to favor the view of introduction from the mainland.

At this stage of the study, therefore, the writer would see the successive introduction of three waves of new industries to Japan: (1) the flake-blades with hand-axes; (2) the true-blades with the burins; and (3) the micro-blades. All the rest could be interpreted as the indigenous development from the previous industries.

Notes: Abstract taken from conclusions.
Location: AEU PMC GN 1 D25
Area: Japan, Japan - Hokkaido
Topics: Archaeological studies - Japan, Archaeological sites - Japan, Archaeological sites - Japan - Hokkaido, Faunal remains, Lithics, Lithic affinities, Geoarchaeology, Human migration

1964 The Continuity of Non-Ceramic to Ceramic Cultures in Japan. Arctic Anthropology 2(2):95-119.

Location: AEU PMC GN 1 A68
Area: Japan
Topics: Archaeological sites - Japan, Lithics, Geoarchaeology, Lithic affinities

Ikawa-Smith, F.

1976 Chronological Framework for the Study of the Palaeolithic in Japan. Asian Perspectives 19:61-90.

Location: AEU PMC DS 514 A83
Area: Japan, Japan - Hokkaido
Topics: Lithics, Geoarchaeology, Archaeological sites - Japan, Faunal remains - *Cervus yabei*, Faunal remains - *Sinomegaceros yabei*, Faunal remains - *Canis lupus*, Faunal remains - *Ursus arctos*, Faunal remains - *Cervus yesoensis*, Faunal remains - *Elephas namadicus*, Faunal remains - *Palaeoloxodon namadicus*, Faunal remains - *Alces kinryuensis*, Human/hominid remains, Faunal remains - *Equus hemionus*, Faunal remains - *Equus caballus*, Faunal remains - *Bison*, Faunal remains - *Bos primigenius*, Faunal remains - *Sinomegaceros ordosianus*, Archaeological sites - Japan - Hokkaido, Climate history, Tephra - Japan, Palaeosols, Sea level changes, Faunal associations, Refugia, Dating - obsidian hydration

1978 Lithic Assemblages from the Early and Middle Upper Pleistocene Formations in Japan. In *Early Man in America from a Circum-Pacific Perspective*, edited by A. L. Bryan, pp. 42-53. Occasional Papers No 1 of the Department of Anthropology, University of Alberta. Archaeological Researches International, Edmonton, Alberta.

In the two and a half decades since the first Paleolithic implements were recovered by a controlled excavation at Iwajuku, 150 km northeast of Tokyo, in 1949, lithic assemblages have been excavated from Pleistocene formations at some 1000 sites in Japan. Available radiocarbon determinations and geological and typological correlations place the overwhelming majority of these assemblages within the temporal range of the Tachikawa Loam of southern Kanto, between about 30,000 BP and 10,000 BP. It is fully accepted that Late Pleistocene Japan was inhabited by numerous human groups possessing highly variable tool kits. There remain, however, some 100 assemblages which are purported to be older than 30,000 BP, and these have been referred to as "Early Paleolithic" in Japan. This paper presents a brief discussion of some of the better known assemblages whose stratigraphic contexts make it possible to assign them to the early and middle parts of the Upper Pleistocene.

There are several assemblages which are suggested to be even older, dating to the Middle and Lower Pleistocene. In contrast to the Upper Pleistocene assemblages, most of the purportedly very early assemblages consist of a few specimens each, and few were obtained under controlled conditions. Furthermore, our lack of detailed knowledge of the Lower and Middle Pleistocene stratigraphy makes it difficult to evaluate their stratigraphic positions accurately.

Notes: Abstract taken from introduction.
Location: AEU HSS GN 17 E12
Area: Japan, Japan - Hokkaido
Topics: Archaeological sites - Japan, Archaeological sites - Japan - Hokkaido, Lithics, Dating - fission track, Dating - obsidian hydration, Sea level changes, Geoarchaeology, Tephra - Japan, Palaeosols, Faunal remains - *Cervus yabei*, Faunal remains - *Sinomegaceros yabei*, Faunal remains - *Canis lupus*, Faunal remains - *Equus*, Faunal remains - *Cervus yesoensis*, Faunal remains - *Ursus arctos*, Faunal associations, Human/hominid remains

1978 The History of Early Paleolithic Research in Japan. In *Early Paleolithic in South and East Asia*, edited by F. Ikawa-Smith, pp. 247-286. Aldine Publishing Company, Chicago, Illinois.

Location: AEU HSS GN 772.3 A1 E12
Area: Japan, Japan - Hokkaido
Topics: Archaeological studies - Japan, Archaeological sites - Japan, Archaeological sites - Japan - Hokkaido, Lithics, Geoarchaeology, Lithic affinities, Palaeosols, Loess, Sea level changes

1980 Current Issues in Japanese Archaeology. American Scientist 68:134-145.

Location: AEU SCI Q 1 A51
Area: Japan
Topics: Archaeological sites - Japan, Lithics, Geoarchaeology, Sea level changes, Human migration, Faunal migration, Archaeological studies - Japan, Lithic affinities

Inada, T.

1987 The Palaeolithic Age. Translated by G. L. Barnes. In *Recent Archaeological Discoveries in Japan*, edited by K. Tsuboi, pp. 5-23. The Centre for East Asian Cultural Studies, Tokyo, Japan.

Location: AEU HSS DS 815 R295
Area: Japan, Japan - Hokkaido
Topics: Archaeological sites - Japan, Archaeological sites - Japan - Hokkaido, Lithics, Geoarchaeology, Tephra - Japan, Palaeosols, Plant macrofossils - peat, Faunal remains - *Bison priscus*, Faunal remains - *Alces kinryuensis*, Faunal remains - *Loxodonta tokunagai*, Faunal remains - *Elephas naumanni*, Faunal remains - *Sinomegaceros yabei*, Archaeological studies - Japan

Keally, C. T.

1986 Some Key Characteristics of Japanese Pleistocene Archaeology. Current Research in the Pleistocene 3:94-95.

Location: AEU HSS E 61 C97
Area: Japan
Topics: Geoarchaeology, Archaeological studies - Japan, Lithics, Dating

1987 Japan's "Early Paleolithic": Recent Pro and Con. Current Research in the Pleistocene 4:19-20.

Location: AEA PMA/ASA
Area: Japan
Topics: Archaeological sites - Japan, Lithics, Lithic affinities, Archaeological studies - Japan

1988 Recent Advances in Pleistocene Archaeology in Northern Japan. Current Research in the Pleistocene 5:13-15.

Location: AEA PMA/ASA
Area: Japan, Japan - Hokkaido
Topics: Lithics, Archaeological sites - Japan, Archaeological sites - Japan - Hokkaido, Dating, Lithic affinities, Archaeological studies - Japan

Keally, C. T., and I. Hayakawa
1987 The 30,000-Year-Old Lithic Components from the Musashidai Site, Tokyo, Japan. Current Research in the Pleistocene 4:61-64.

Location: AEA PMA/ASA
Area: Japan
Topics: Archaeological sites - Japan, Lithics, Geoarchaeology

Keally, C. T., and H. Miyazaki
1986 A Terminal Pleistocene Salmon-Fishing and Lithic Worksite at Maeda Kochi, Tokyo, Japan. Current Research in the Pleistocene 3:96-97.

Location: AEU HSS E 61 C97
Area: Japan
Topics: Faunal remains - fish, Faunal remains - *Selenarctos thibetanus*, Lithics, Archaeological sites - Japan

Kobayashi, T.
1970 Microblade Industries in the Japanese Archipelago. Arctic Anthropology 7(2):38-58.

Location: AEU PMC GN 1 A68
Area: Japan, Japan - Hokkaido
Topics: Archaeological sites - Japan, Archaeological sites - Japan - Hokkaido, Archaeological sites - Siberia, Lithics, Lithic affinities, Cultural traditions

Maringer, J.
1953 The Palaeolithic Period in Japan. Man 53:21-23.

Location: AEU PMC GN 1 M25
Area: Japan, Korea
Topics: Sea level changes, Faunal migration, Faunal remains, Faunal remains - *Elephas*, Faunal remains - *Palaeoloxodon naumanni*, Lithics, Archaeological sites - Japan, Archaeological sites - Korea

1957 Some Stone Tools of Early Hoabinhian Type from Central Japan. Man 57:1-4.

Location: AEU PMC GN 1 M25
Area: Japan, Japan - Hokkaido
Topics: Sea level changes, Faunal remains - *Mammonteus primigenius*, Archaeological sites - Japan, Lithics, Geoarchaeology, Lithic affinities

Morlan, R. E.
1967 The Preceramic Period of Hokkaido: An Outline. Arctic Anthropology 4(1):164-220.

Location: AEU PMC GN 1 A68
Area: Japan - Hokkaido
Topics: Lithics, Dating - obsidian hydration, Climate history - Japan, Pollen records - Japan, Geoarchaeology, Modern biogeography, Sea level changes, Archaeological sites - Japan, Archaeological sites - Japan -

Hokkaido, Archaeological sites - Western Beringia, Archaeological sites - China, Lithic affinities, Human migration, Faunal migration, Faunal remains - *Mammonteus primigenius*, Faunal remains - *Palaeoloxodon namadicus*

1967 Chronometric Dating in Japan. Arctic Anthropology 4(2):180-211.

The chronometric dates presented in this paper represent just the beginning of attempts to establish the time depth of Japanese prehistoric events and to test the relative chronologies which have long been based solely upon stratigraphic and typological considerations. A general framework has begun to emerge and is summarized in Table 4, but this framework is still tentative at best and can be expected to undergo revisions and corrections which might even be sizeable.

Notes: Conclusions used as abstract.
Location: AEU PMC GN 1 A68
Area: Japan, Japan - Hokkaido
Topics: Geoarchaeology, Dating - radiocarbon, Dating - obsidian hydration, Plant macrofossils - wood, Plant macrofossils - peat, Faunal remains - *Mammonteus primigenius*, Archaeological sites - Japan, Archaeological sites - Japan - Hokkaido

1976 Technological Characteristics of some Wedge-Shaped Cores in Northwestern North America and Northeast Asia. Asian Perspectives 19:96-106.

Location: AEU PMC DS 514 A83
Area: Japan, Japan - Hokkaido, Siberia, Western Beringia, Alaska, Eastern Beringia, Kamchatka
Topics: Lithics, Archaeological sites - Japan - Hokkaido, Archaeological sites - Lake Ushki, Archaeological sites - Siberia, Archaeological sites - Anangula, Archaeological sites - Alaska, Lithic affinities

Morlan, V. J.

1971 The Preceramic Period of Japan: Honshu, Shikoku, and Kyushu. Arctic Anthropology 8(1):136–170.

Following a brief discussion of Pleistocene geology and environment, this paper surveys Japanese preceramic materials in terms of a number of technological patterns involved in artifact production. Discussion proceeds in terms of various forms of heavy tool technology, elongate flake technology, microblade technology, and bifacial technology. The evidence for chronology is presented, and, finally, a reconstruction of culture history during the Pleistocene of Japan is offered.

There appears to be no unequivocal evidence of pre-Wisconsin maximum human occupation of Japan. Assemblages characterized by heavy tools of "Lower Palaeolithic" types have been recovered but either the specimens are only questionably man-made or the stratigraphy and/or chronology are in doubt. During the late Upper Pleistocene, there are two major zones in the distribution of elongate flake technologies in Japan. The northern zone, including Hokkaido and northern Honshu, is characterized by a highly sophisticated blade and burin technology while the southern zone, including central Honshu and southern Japan, is characterized by technologies based on end-blow, side-blow, and blade-like flake production. Knife forms and bifacial, leaf-shaped points are frequently associated with these elongate flake forms in the southern zone of Japan. The blade technology of the northern zone is believed to have entered northern Honshu from Hokkaido in the north across Tsugaru Strait and is derived from the general Aurignacoid technological tradition which spread across the north Eurasian plains during the late Upper Pleistocene. The elongate flake technologies of the southern zone do not fit the Aurignacoid pattern; they may represent an indigenous development from earlier industries in Japan or separate entrance into Japan during or after the Wisconsin maximum by way of a southern route from the mainland. Two major microlithic complexes appear to have emerged from elongate flake industries in Hokkaido and Kyushu. These northern and southern complexes spread toward one another until they reached their respective limits in central Honshu. Non-blade, elongate flake complexes with well-developed bifacial techniques may have persisted in central Honshu where stemmed forms of points developed from unstemmed forms. Toward the close of the Pleistocene, a third microlithic technology - represented in Fukui complex - appears suddenly in northwest Kyushu, in association with pottery. This microlithic complex did not spread further, but the ceramic technology diffused northward where it encountered an

expanding stemmed point diffusion as well as southward where the southern microlithic complex persisted in southern Kyushu.

Location: AEU PMC GN 1 A68
Area: Japan
Topics: Archaeological studies - Japan, Geoarchaeology, Sea level changes, Archaeological sites - Japan, Lithics, Lithic affinities

Ohyi, H.

1978 Some Comments on the Early Paleolithic of Japan. In *Early Paleolithic in South and East Asia*, edited by F. Ikawa-Smith, pp. 299-301. Aldine Publishing Company, Chicago, Illinois.

Notes: See Serizawa 1978.
Location: AEU HSS GN 772.3 A1 E12
Area: Japan
Topics: Archaeological sites - Japan, Lithics, Lithic affinities

Okada, A., H. Okada, and C. S. Chard

1967 An Annotated Bibliography of the Archaeology of Hokkaido. Arctic Anthropology 4(1):1-163.

Location: AEU PMC GN 1 A68
Area: Japan - Hokkaido
Topics: Bibliography - Japanese archaeology (Hokkaido), Archaeological sites - Japan - Hokkaido, Geoarchaeology, Lithics, Lithic affinities, Bone modification, Vegetation history - Japan, Plant macrofossils

Serizawa, C.

1970 The Chronological Sequence of the Palaeolithic Cultures of Japan and the Relationship with Mainland Asia. In *Proceedings VIIIth International Congress of Anthropological and Ethnological Sciences, Tokyo and Kyoto, 1968. Volume III. Ethnology and Archaeology*. Symposium S-11 Prehistoric Cultural Relationships in Northern Eurasia and Northern North America, pp. 353-357. Science Council of Japan, Tokyo, Japan.

Location: AEU SCI GN 3 I59
Area: Japan
Topics: Archaeological sites - Japan, Lithics, Faunal remains - *Elephas namadicus naumanni*, Cultural traditions, Lithic affinities

1976 The Stone Age of Japan. Asian Perspectives 19:1-14.

Location: AEU PMC DS 514 A83
Area: Japan, Japan - Hokkaido
Topics: Lithics, Archaeological sites - Japan, Archaeological sites - Japan - Hokkaido, Archaeological sites - China, Geoarchaeology, Lithics, Lithic affinities

1978 The Early Paleolithic in Japan. In *Early Paleolithic in South and East Asia*, edited by F. Ikawa-Smith, pp. 287-297. Aldine Publishing Company, Chicago, Illinois.

Location: AEU HSS GN 772.3 A1 E12
Area: Japan
Topics: Archaeological sites - Japan, Geoarchaeology, Molluscs, Sea level changes, Lithics, Faunal remains - *Equus hemionus*

Serizawa, C., and M. Yoshizaki

1976 The Palaeolithic of the Japanese Archipelago. In *Colloque 18, Le Premier Peuplement de L'Archipel Nippon et des Iles du Pacifique: Chronologie, Paléogéographie, Industries*, edited by C. Serizawa, p. 43. Union Internationale des Sciences Préhistoriques et Protohistoriques, IX^e^ Congrès, Nice, France, 13-18 Septembre 1976.

Location: AEU HSS GN 772.3 A1 I625
Area: Japan
Topics: Geoarchaeology, Archaeological sites - Japan, Lithics, Sea level changes

Yoshizaki, M., and M. Iwasaki

1986 Babadan Locality A: Recent Discovery of the Middle Pleistocene Occupation of Japan. Canadian Journal of Anthropology 5(1):3-9.

An ongoing multidisciplinary research project in the Ego River Valley, Miyagi Prefecture, northeast Honshu, has uncovered stratigraphic evidence for Lower, Middle and Late Paleolithic artifact assemblages datable between 100,000 and more than 170,000 B.P. Volcanic ash strata at Babadan locality A yielded retouched flakes from stratum 10, the most recent occupation; choppers, pseudo-handaxes and scrapers from stratum 19; an assemblage of small flake tools from stratum 20; and some large flake tools from stratum 33. The middle Pleistocene occupation of Japan by people who evidently had some sort of watercraft is relevant to the hypothesis that North America was originally peopled by maritime adapted East Asians.

Location: AEU PMC GN 1 C22
Area: Japan
Topics: Archaeological sites - Japan, Geoarchaeology, Lithics, Tephra - Japan

PART 5. MODERN BIOGEOGRAPHY

Igarashi, Y.

1979 Pollen Incidence and Wind Transport in Central Hokkaido. Journal of the Faculty of Science, Hokkaido University, Series IV: Geology and Mineralogy 19(1-2):257-264.

Four pollen traps at different levels were used in a natural broad-leafed forest near Tomakomai, central Hokkaido, to investigate pollen incidence and wind transport. The trap at trunk level captured a lesser amount of pollen than the other traps. The pollen period of the canopy trees was from March to the middle of June and it was characterized by a gradual increase in amount of pollen but a sharp decrease. Among the canopy trees, *Carpinus*, *Quercus*, *Alnus*, *Betula* and *Cryptomeria* showed the highest pollen frequency. Pollen transported into the sampling site were those of *Cryptomeria*, *Fagus*, *Aesculus*, *Castanea* and *Tsuga*. Although *Cryptomeria* pollen accounted for 38-48% of the total amount of the canopy tree pollen in the middle of April 1978, the nearest *Cryptomeria*-bearing forest is about 16 km west of the sampling site.

Location: AEU SCI QE 1 H72
Area: Japan - Hokkaido
Topics: Pollen analysis - Japan, Modern biogeography, Pollen analysis - modern pollen spectra

SECTION F. CONTINENTAL SHELF AND OFFSHORE ISLANDS

PART 1. LATE QUATERNARY GEOLOGY

Alley, N. F., and S. C. Chatwin

1979 Late Pleistocene History and Geomorphology, Southwestern Vancouver Island, British Columbia. Canadian Journal of Earth Sciences 16:1645-1657.

The major Pleistocene deposits and landforms on southwestern Vancouver Island are the result of the Late Wisconsin (Fraser) Glaciation. Cordilleran glaciers formed in the Vancouver Island Mountains and the Coast Mountains had advanced down Strait of Georgia to southeastern Vancouver Island after 19 000 years BP. The ice split into the Puget and Juan de Fuca lobes, the latter damming small lakes along the southwestern coastal slope of the island. During the maximum of the glaciation (Vashon Stade), southern Vancouver Island lay completely under the cover of an ice-sheet which flowed in a south-southwesterly direction across Juan de Fuca Strait, eventually terminating on the edge of the continental shelf. Deglaciation was by downwasting during which ice thinned into major valleys and the strait. Most upland areas were free of ice down to an elevation of 400 m by before 13 000 years BP. A possible glacier standstill and (or) resurgence occurred along Juan de Fuca Strait and in some interior upland valleys before deglaciation was complete. Glacial lakes occupied major valleys during later stages of deglaciation.

Location: AEU SCI QE 1 C212
Area: British Columbia - southwestern
Topics: Glacial history - Pacific margin, Stratigraphy, Plant macrofossils, Glacial geomorphology, Glacial lake sequences

Barrie, J. V., and K. W. Conway

1991 Rapid Sea Level Rise and Resultant Coastal Evolution on the Pacific Margin of Canada. In *INQUA, 13th International Congress, Beijing, China, Abstracts*, p. 17.

Area: Canada - western, British Columbia - Queen Charlotte Islands
Topics: Sea level changes, Stratigraphy

Black, R. F.

1966 Late Pleistocene to Recent History of Bering Sea-Alaska Coast and Man. Arctic Anthropology 3(2):7-22.

Location: AEU PMC GN 1 A68
Area: Alaska - southwestern, Aleutian Islands
Topics: Sea level changes, Review of glacial history - Aleutian Islands, Archaeological sites - Anangula

1976 Geology of Umnak Island, Eastern Aleutian Islands as Related to the Aleuts. Arctic and Alpine Research 8:7-35.

Umnak Island, eastern Aleutian Islands, is capped by active volcanoes, was extensively glaciated, and is being eroded rapidly by the sea. During the Holocene, Umnak and other Aleutian Islands had the most equable climate, the best year-round food supply, and the least displacement of coastlines from sea-level fluctuations of all the Bering Land Bridge, the migration route of ancient peoples to the Western Hemisphere. The Aleuts could have entered the eastern Aleutians after about 11,000 to 12,000 years ago when massive ice caps waned. They were marine oriented, came with boats, and had minimal landbased food resources. The earliest known occupation, at Anangula, is 8400 years old, and existed there perhaps a generation or century. Occupation in southwest Umnak Island was probably continuous to the present day, but gaps occur in the early record. Sandy Beach site may date from the abandonment of Anangula and is a large and important area of occupation. Idaliuk and Chaluka were occupied during the Hypsithermal, but only Chaluka is large and carried through to the present. The Aleuts have always been influenced markedly by geologic processes, especially volcanic eruptions, coastal erosion and deposition, and wind-induced upwelling that enhances the marine biomass. The most important geologic event probably was the cutting of strandflats during the Hypsithermal, about 8250 to 3000 years ago.

This led to an enormous increase in renewable food resources easily gathered year around and the apparent proliferation of Aleuts in post-Hypsithermal time. A Neoglacial advance to the sea of alpine glaciers does not seem to have affected them.

Location: AEU SCI G 1 A68
Area: Alaska - southwestern, Aleutian Islands
Topics: Human migration, Stratigraphy, Glacial history - Pacific margin, Sea level changes, Archaeological sites - Aleutian Islands, Archaeological sites - Anangula, Geoarchaeology, Tephra - Aleutian Islands, Beringian land bridge connection, Palaeowinds, Palaeosols, Dating - analysis of radiocarbon dates, Plant macrofossils

1978 Aleut Occupation Sites and Strandflats were Controlled Primarily by Holocene Sea Level in the Aleutian Islands, Alaska. In *AMQUA, 5th Biennial Meeting, Edmonton, Alberta, Abstracts*, p. 186.

Location: AEU HSS QE 696 A5212
Area: Alaska - southwestern, Aleutian Islands
Topics: Sea level changes

Blaise, B.

1989 Clay-Mineral Assemblages from Late Quaternary Deposits on Vancouver Island, Southwestern British Columbia, Canada. Quaternary Research 31:41-56.

On Vancouver Island, the Dashwood Drift, Cowichan Head Formation, Quadra Sand, and Vashon Drift were deposited during late Pleistocene glacial and interstadial periods and show large variations in clay-mineral contents partly related to changing climatic conditions. Glacial deposits are characterized by iron-rich chlorite, illite (both well crystallized), and smectite with a morphology reflecting rapid derivation from volcanic rocks. The clay mineralogy of nonglacial deposits is more complex, and is marked by the presence of vermiculite, kaolinite, halloysite, and irregular mixed-layer minerals. Nonglacial clay minerals are poorly preserved and show a higher state of alteration due to pedogenesis. Large variations in nonglacial deposits compared to glacial deposits are also due to secondary factors such as selective sorting, soil and rock source variations, differences in sedimentary environment, and diagenesis. These secondary factors do not seem to obliterate significantly the climatic imprint on the clay minerals. These studies also permit the recognition of glacially reworked sediments, the determination of relationships between two units in the same section, and the establishment of the conditions of clay-mineral formation.

Location: AEU SCI QE 696 Q24
Area: British Columbia - southwestern
Topics: Stratigraphy, Clay mineralogy, Glacial history - Pacific margin

Blaise, B., J. J. Clague, and R. W. Mathewes

1990 Time of Maximum Late Wisconsin Glaciation, West Coast of Canada. Quaternary Research 34:282-295.

New data from a deep-sea core in the eastern North Pacific Ocean indicate that the western margin of the Late Wisconsin Cordilleran Ice Sheet began to retreat from its maximum position after 15,600 yr B.P. Ice-rafted detritus is present in the core below the 15,600 yr B.P. level and was deposited while lobes of the Cordilleran Ice Sheet advanced across the continental shelf in Queen Charlotte Sound, Hecate Strait, and Dixon Entrance. The core data are complemented by stratigraphic evidence and radiocarbon ages from Quaternary exposures bordering Hecate Strait and Dixon Entrance. These indicate that piedmont lobes reached the east and north shores of Graham Island (part of the Queen Charlotte Islands) between about 23,000 and 21,000 yr B.P. Sometime thereafter, but before 15,000-16,000 yr B.P., these glaciers achieved their greatest Late Wisconsin extent. Radiocarbon ages of late-glacial and postglacial sediments from Queen Charlotte Sound, Hecate Strait, and adjacent land areas show that deglaciation began in these areas before 15,000 yr B.P. and that the shelf was completely free of ice by 13,000 yr B.P.

Location: AEU SCI QE 696 Q24
Area: Queen Charlotte Sound, British Columbia - Queen Charlotte Islands
Topics: Ocean cores, Glacial history - Pacific margin, Stratigraphy, Plant macrofossils - *Salix* twigs, Plant macrofossils - bryophytes, Plant macrofossils - wood, Insect macrofossils - beetles, Dating - analysis of radiocarbon dates, Sea level changes, Magnetic susceptibility

Blasco, S. M., J. Brigham-Grette, and P. R. Hill
1989 Offshore Constraints on the Late Pleistocene Glacial History at the Mouth of the Mackenzie River. In *Late Cenozoic History of the Interior Basins of Alaska and the Yukon*, edited by L. D. Carter, T. D. Hamilton and J. P. Galloway, pp. 15-17. Circular 1026. United States Geological Survey.

Location: AEU SCI QE 75 C57
Area: Northwest Territories, Beaufort Sea
Topics: Glacial history - Arctic margin, Stratigraphy, Sea level changes

Booth, D. B.
1986 Mass Balance and Sliding Velocity of the Puget Lobe of the Cordilleran Ice Sheet During the Last Glaciation. Quaternary Research 25:269-280.

An estimate of the sliding velocity and basal meltwater discharge of the Puget lobe of the Cordilleran ice sheet can be calculated from its reconstructed extent, altitude, and mass balance. Lobe dimensions and surface altitudes are inferred from ice limits and flow-direction indicators. Net annual balance and total ablation are calculated from relations empirically derived from modern maritime glaciers. An equilibrium-line altitude between 1200 and 1250 m is calculated for the maximum glacial advance (ca. 15,000 yr B.P.) during the Vashon Stade of the Fraser Glaciation. This estimate is in accord with geologic data and is insensitive to plausible variability in the parameters used in the reconstruction. Resultant sliding velocities are as much as 650 m/a at the equilibrium line, decreasing both up- and downglacier. Such velocities for an ice sheet of this size are consistent with nonsurging behavior. Average meltwater discharge increases monotonically downglacier to 3000 m^3/sec at the terminus and is of a comparable magnitude to ice discharge over much of the glacier's ablation area. Paleoclimatic inferences derived from this reconstruction are consistent with previous, independently derived studies of late Pleistocene temperature and precipitation in the Pacific Northwest.

Location: AEU SCI QE 696 Q24
Area: Washington - northwestern, British Columbia - southwestern
Topics: Glacial dynamics, Glacial history - Pacific margin, Ice limit reconstruction

Clague, J. J.
1975 Late Quaternary Sea Level Fluctuations, Pacific Coast of Canada and Adjacent Areas. Geological Survey of Canada Paper 75-1C:17-21. Geological Survey of Canada, Ottawa, Ontario.

Changes in the land-sea positions on the Pacific Coast of Canada during Quaternary time have resulted from a combination of eustatic, isostatic, and tectonic adjustments. Because these adjustments may occur independently or semi-independently of one another, it is difficult to assess the contribution of each to dated sea level stands different from the present. However, it is possible to date former shorelines and sediments deposited during former sea level stands, and thus to construct curves showing the net effect on sea level of eustatic, isostatic, and tectonic adjustments through time.

This report is a summary of published accounts of former land-sea relationships in British Columbia and adjacent parts of the State of Washington. Sea level changes in southeastern Alaska are also briefly discussed. Published information pertains almost entirely to relative sea level positions which postdate the late Wisconsin glaciation in the Pacific Northwest (referred to as the Fraser Glaciation).

Notes: Introduction used as abstract.
Location: AEU SCI QE 185 C2
Area: Washington - northwestern, British Columbia - southwestern, British Columbia - northwestern, Alaska - southeastern

Topics: Glacial history - Pacific margin, Sea level changes, Tectonism

1976 Quadra Sand and its Relation to the Late Wisconsin Glaciation of Southwest British Columbia. Canadian Journal of Earth Sciences 13:803-815.

Quadra Sand is a late Pleistocene lithostratigraphic unit with widespread distribution in the Georgia Depression, British Columbia and Puget Lowland, Washington. The unit consists mainly of horizontally and cross-stratified, well sorted sand. It is overlain by till deposited during the Fraser Glaciation and is underlain by fluvial and marine sediments deposited during the preceding nonglacial interval.

Quadra Sand was deposited progressively down the axis of the Georgia-Puget Lowland from source areas in the Coast Mountains to the north and northeast. The unit is markedly diachronous; it is older than 29 000 radiocarbon years at the north end of the Strait of Georgia, but is younger than 15 000 years at the south end of Puget Sound.

Aggradation of the unit occurred during the climatic deterioration at the beginning of the Fraser Glaciation. Thick, well sorted sand was deposited in part as distal outwash aprons at successive positions in front of, and perhaps along the margins of, glaciers advancing from the Coast Mountains into the Georgia-Puget Lowland during late Wisconsin time.

The sand thus provides a minimum age for the initial climatic change accompanying the Fraser Glaciation. This change apparently occurred before 28 800 y BP, substantially earlier than glacial occupation of the southern Interior Plateau of British Columbia. Thus, several thousand years may have intervened between the alpine and ice-sheet phases of the Fraser Glaciation.

Location: AEU SCI QE 1 C212
Area: British Columbia - southwestern, Washington - northwestern
Topics: Stratigraphy, Glacial history - Pacific margin, Pollen records - Pacific margin, Plant macrofossils - wood, Plant macrofossils - peat, Climate history - Pacific margin

Clague, J. J., J. E. Armstrong, and W. H. Mathews

1980 Advance of the Late Wisconsin Cordilleran Ice Sheet in Southern British Columbia Since 22,000 Yr B.P. Quaternary Research 13:322-326.

Radiocarbon dates from critical stratigraphic localities in southern British Columbia indicate that the growth history of the late Wisconsin Cordilleran Ice Sheet was different from that of most of the Laurentide Ice Sheet to the east. Much of southern British Columbia remained free of ice until after about 19,000 to 20,000 yr ago; only adjacent to the Coast Mountains is there a record of lowland glacier tongues in the interval 22,000 to 20,000 yr B.P. A major advance to the climax of late Wisconsin Cordilleran glacier ice in the northern States was not begun until after about 18,000 yr B.P. in the southwest of British Columbia and after about 17,500 yr B.P. in the southeast. The rate of glacier growth must have been very rapid in the two to three millennia prior to the climax, which has been dated in western Washington at shortly after 15,000 yr B.P.

Location: AEU SCI QE 696 Q24
Area: British Columbia - southwestern
Topics: Glacial history - Pacific margin, Plant macrofossils - wood, Plant macrofossils - peat, Dating - analysis of radiocarbon dates

Creager, J. S., and D. A. McManus

1967 Geology of the Floor of Bering and Chukchi Seas - American Studies. In *The Bering Land Bridge*, edited by D. M. Hopkins, pp. 7-31. Stanford University Press, Stanford, California.

Subbottom reflection profiles collected by D. Moore north of the latitude of St. Lawrence Island suggest that bedrock south of Bering Strait is structureless crystalline rock, whereas bedrock north of Bering Strait is folded sedimentary rock. Although the bedrock has been deeply dissected in some localities, such as the area north of St. Lawrence Island where local bedrock relief is as much as 30 meters, it generally spans no more than 3 to 9 meters in relief. Sediment cover is generally thin throughout the Bering and Chukchi Seas, occurring mainly as fill in the depressions in the buried bedrock topography.

Few long cores of the sediment overburden have been taken. A 7-meter piston core in southeastern Chukchi Sea, representing essentially the entire sediment fill of a buried valley, records a sea-level stillstand approximately 12,000 years ago at about -38 meters. The stillstand is recorded by the lower 5.5 meters of core, which was deposited within an interval of only about 500 years, and which records deltaic deposition in an estuarine environment. The upper 1.5 meters of sediment are marine. This information, together with the subbottom reflection profiles, suggests that the sediment overburden of both coastal plain and marine deposits in Bering and Chukchi Seas is largely of late Wisconsin and post-Wisconsin age.

The final break in the land link between the continents appears to have occurred when the post-Wisconsin transgression covered the sill west of St. Lawrence Island. This sill 46 meters deep is shallower than the sills near Bering Strait. Its configuration associates it with a possible glacial origin, suggesting that the sill is not the result of post-Wisconsin deposition. The land bridge no longer existed when sea level stood at -38 meters 12,000 years ago.

Notes: Based on a Symposium held at the VII Congress of the International Association for Quaternary Research (INQUA), Boulder, Colorado, 1965. Summary used as abstract.
Location: AEU SCI QE 39 H79
Area: Bering-Chukchi Platform, Bering Sea
Topics: Foraminifera, Sedimentation rates, Tectonism, Beringian land bridge connection, Sea level changes, Ocean cores, Sedimentology

Demidov, N. T., and V. D. Dmitriev

1991 Evolution of the Kamchatka Shoreline in the Quaternary. In *INQUA, 13th International Congress, Beijing, China, Abstracts*, p. 73.

Area: Pacific Ocean - northwestern
Topics: Sea level changes, Tectonism

Easterbrook, D. J.

1969 Pleistocene Chronology of the Puget Lowland and San Juan Islands, Washington. Geological Society of America Bulletin 80:2273-2286.

The Puget Lowland and San Juan Islands, lying in the Puget Trough between the Cascade Range and the Olympic Mountains, were in the path of Pleistocene ice sheets which flowed southward from Canada.

Floodplain silt, sand, and peat of the Whidbey Formation were deposited prior to 40,000 years ago, during an interglaciation believed to be equivalent to the Puyallup and Sangamon Interglaciations. Possession Drift, which overlies sediments of the Whidbey Formation, is radiocarbon dated at 34,000 $^{+3000}_{-2000}$ years B.P. in its upper part and is limited by a radiocarbon age of >39,900 in its lower part. The Possession is correlated with late phases of the Zyriansk Glaciation in Russia and the early Würm in Europe.

Peat lying on the Possession Drift yielded radiocarbon dates between 27,200 $^{+1000}_{-900}$ and 22,700 ± 550, representing the Olympia Interglaciation which is correlated with the Karginsk Interglaciation of Russia, the Paudorf Interval of Europe and the Farmdalian of the midwestern United States.

Esperance Sand, deposited by meltwater streams in front of advancing ice during the Fraser Glaciation and subsequently overridden during the Vashon Stade, was radiocarbon dated at 18,000 ± 400 years. During deglaciation, the ice sheet thinned until it floated in marine water and poorly sorted, fossiliferous glaciomarine drift was deposited in the Everson Interstade. Shell-bearing sediment at altitudes up to 400 feet above present sea level and unfossiliferous glaciomarine drift up to 600 feet indicate that relative sea level at that time was 500 to 700 feet higher. Eighteen radiocarbon dates from marine shells in Everson glaciomarine drift vary from 10,370 ± 300 to 13,010 ± 170 years. The Everson Interstade ended with lowering of relative sea level to approximately its present position and the disappearance of floating ice. The following Sumas Stade ended shortly before 9,920 ± 760 years ago.

Location: AEU SCI QE 1 G341
Area: Washington - northwestern
Topics: Stratigraphy, Glacial history - Pacific margin, Plant macrofossils, Molluscs - marine

1970 Glacial Events in the Puget Lowland, Washington between 14,000 and 10,000 Years Ago. In *AMQUA, 1st Biennial Meeting, Abstracts*, p. 39.

Location: AEU HSS QE 696 A52
Area: Washington - northwestern
Topics: Glacial history - Pacific margin

1986 Stratigraphy and Chronology of Quaternary Deposits of the Puget Lowland and Olympic Mountains of Washington and the Cascade Mountains of Washington and Oregon. Quaternary Science Reviews 5:145-159.

Notes: Special volume, *Quaternary Glaciations of the Northern Hemisphere*, edited by V. Sibrava, D. Q. Bowen, and G. M. Richmond. Report of IGCP Project 24.
Location: AEU SCI QE 696 Q245
Area: Washington - northwestern
Topics: Dating - analysis of radiocarbon dates, Plant macrofossils - wood, Glacial history - Pacific margin, Review of stratigraphy - Washington - northwestern, Pollen records, Plant macrofossils - peat, Tephra - Washington

Gershanovich, D. E.

1967 Late Quaternary Sediments of Bering Sea and the Gulf of Alaska. In *The Bering Land Bridge*, edited by D. M. Hopkins, pp. 32-46. Stanford University Press, Stanford, California.

Notes: Based on a Symposium held at the VII Congress of the International Association for Quaternary Research (INQUA), Boulder, Colorado, 1965.
Location: AEU SCI QE 39 H79
Area: Bering Sea
Topics: Sedimentation rates, Ocean cores, Sedimentology, Sea level changes

Hampton, M. A.

1985 Quaternary Sedimentation in Shelikof Strait, Alaska. Marine Geology 62:213-253.

Shelikof Strait, a nearly parallel-sided marine channel between the Kodiak island group and the Alaska Penninsula [sic], has experienced a succession of distinct sedimentary environments during Quaternary time. Pleistocene glaciers carved a deep basin into bedrock in the southwest part of the strait and a shallower platform surface with incised channels in the northeast. The basin and channels were filled with glacial and glacial-marine sediment before and during the time that ice retreated and oceanic conditions returned. Restricted marine conditions prevailed in early Holocene time and sediment prograded transversely into the strait from the adjacent landmasses, with some localized dispersal to the deep, central strait. Onset of modern open-marine conditions commenced when regional currents breached the sill across Kennedy and Stevenson Entrances to combine with sediment-laden outflow from Cook Inlet and deposit a blanket of well-stratified sediment throughout the strait.

Location: AEU SCI QE 1 M33
Area: Alaska - southern
Topics: Palaeochannels, Ocean cores, Stratigraphy, Sedimentology, Glacial history - Pacific margin

Heller, P. L.

1980 Multiple Ice Flow Directions During the Fraser Glaciation in the Lower Skagit River Drainage, Northern Cascade Range, Washington. Arctic and Alpine Research 12:299-308.

Stratigraphic mapping and pebble-count data suggest that ice flowed in three different directions in the lower Skagit drainage of the northern Cascade Range during the Fraser Glaciation (~ 10K to 20K BP). Glacier reconstructions suggest that till exposed at one site in the lower Skagit Valley was deposited by a Baker Valley glacier that flowed westward down the Skagit Valley during the early part of the Fraser Glaciation (Evans Creek Stade). Stratigraphic relations show that the Cordilleran Ice Sheet subsequently advanced up the Skagit Valley and into the Baker Valley during the Vashon Stade. Flow-direction indicators, as well as clast compositional variations in till and recessional deposits of Vashon age, indicate that this upvalley, eastward-advancing glacier was later overwhelmed by south-east-flowing ice of the Cordilleran Ice Sheet which entered the Baker Valley across the valley divide to the northwest.

Location: AEU SCI G 1 A68
Area: Washington - northwestern
Topics: Glacial history - Pacific margin, Stratigraphy, Glacial lake sequences, Clay mineralogy

Hicock, S. R.

1984 Southwest British Columbia: Pleistocene Chronology, Stratigraphy and Correlation. In *Correlation of Quaternary Chronologies*, edited by W. C. Mahaney, pp. 479-489. Geo Books, Norwich, England.

A record of two major nonglacial and two major glacial episodes is presently exposed in southwest British Columbia. An older (Illinoian?) till is also exposed at two sites at the southern end of Vancouver Island; evidence of older glacial and nonglacial sediments has been encountered in numerous drillholes. Deposits of the last (Fraser) glaciation have been well dated and correlated by the radiocarbon method. The age of the Olympia nonglacial interval and correlation of the Cowichan Head Formation have been established by abundant ^{14}C dates, uranium series dates, amino acid racemization D/L ratios on wood, and arboreal pollen assemblages. Sediments formed during the penultimate glaciation, and nonglacial deposits underlying them, are beyond the range of conventional ^{14}C dating. They may be correlated and differentiated from younger units by amino acid D/L ratios on marine molluscs and wood, and by arboreal pollen assemblages. A glaciomarine unit in penultimate glacial drift also appears to be correlatable across the Strait of Georgia by vectors or remanent magnetic inclination and declination. Absolute ages of the older sediments may be discovered when the temperature and pH histories of organic remains can be accurately estimated and applied to amino acid age determination equations. Thermoluminescence dating of inorganic material from these deposits is also in progress.

Notes: Conclusions used as abstract.
Location: AEU SCI QE 696 C82
Area: British Columbia - southwestern, Washington - northwestern
Topics: Glacial history - Pacific margin, Stratigraphy, Dating - amino acid, Dating - uranium series, Palaeomagnetism, Pollen records - Pacific margin, Molluscs, Plant macrofossils - wood

Hill, P. R., P. J. Mudie, K. Moran, and S. M. Blasco

1985 A Sea-Level Curve for the Canadian Beaufort Shelf. Canadian Journal of Earth Sciences 22:1383–1393.

Radiocarbon-dated peat and peaty clay samples from geotechnical boreholes in the Canadian Beaufort continental shelf have been used to reconstruct a late Quaternary relative sea-level (RSL) curve. The samples were carefully selected and evaluated using palynological techniques, to ensure that reasonable age error limits could be given to each sample. The dated samples were then related to the local geological setting, using seismic profiles to determine the environment of deposition. The resulting data show a rise of 140 m in RSL since 27 000 years BP. A minor lowering of RSL at some time between 20 000 and 10 000 years BP is inferred from acoustic data. Contributions from basin subsidence, sediment loading, and consolidation account for 35 m of the total RSL rise. The RSL curve is interpreted in the light of recent models of the isostatic and eustatic responses of the Earth's crust at the Laurentide ice-sheet margin. Ice may have been more extensive during the middle Wisconsinan than previously thought and may have caused the major lowering of sea level in the shelf area. This ice may have advanced to within several hundred kilometres of the Mackenzie Delta - Tuktoyaktuk Peninsula coast. An ice readvance of late Wisconsinan age probably caused a subsequent minor lowering of RSL.

Location: AEU SCI QE 1 C212
Area: Northwest Territories - northwestern, Beaufort Sea
Topics: Glacial history - Arctic margin, Stratigraphy, Sea level changes, Pollen analysis - Arctic margin, Plant macrofossils - peat, Plant macrofossils - wood

Luternauer, J. L., J. J. Clague, K. W. Conway, J. V. Barrie, B. Blaise, and R. W. Mathewes
1989 Late Pleistocene Terrestrial Deposits on the Continental Shelf of Western Canada: Evidence for Rapid Sea-Level Change at the End of the Last Glaciation. Geology 17:357-360.

A paleosol with in situ rooted plant remains has been found in a core at a water depth of 95 m on the central continental shelf of British Columbia. Fluvial sediments associated with the paleosol are sharply overlain by lagoonal or shallow pond sediments; these, in turn, are overlain by shallow-marine sediments. Radiocarbon dates on wood fragments and root recovered from the cored sediments indicate that relative sea level was at least 95 m lower 10,500 yr B.P. and that the core site was rapidly transgressed by the sea shortly thereafter. This rapid transgression was contemporaneous with an equally rapid regression at the heads of fiords on the British Columbia mainland to the east. The two are probably genetically linked and a result of late Pleistocene deglaciation and the migration and collapse of a glacial forebulge. Our evidence indicates that large areas of the British Columbia continental shelf were subaerially exposed 11-10 ka. This may have facilitated the southward migration of early humans from Beringia into mid-continental North America at the end of the Pleistocene.

Location: AEU SCI QE 1 G3455
Area: Queen Charlotte Sound
Topics: Ocean cores, Palaeosols, Sea level changes, Plant macrofossils - roots, Plant macrofossils - wood, Stratigraphy, Glacial history - Pacific margin, Pollen analysis - Pacific margin, Human migration, Refugia, Tectonism

Luternauer, J. L., K. W. Conway, and J. J. Clague
1985 Timing and Extent of Late Wisconsinan Glaciation on the Central Continental Shelf off Western Canada. In *CANQUA Symposium on the Paleoenvironmental Reconstruction of the Late Wisconsin Deglaciation and the Holocene, Lethbridge, Program-with-Abstracts and Field Guide*, p. 41.

Area: Queen Charlotte Sound
Topics: Glacial history - Pacific margin, Glacial geomorphology, Stratigraphy

Luternauer, J. L., and J. W. Murray
1969 Sediments of Queen Charlotte Sound, British Columbia. Geological Survey of Canada Paper 69-1, Part A:9-11. Geological Survey of Canada, Ottawa, Ontario.

Location: AEU SCI QE 185 C2
Area: Queen Charlotte Sound
Topics: Ocean cores, Stratigraphy

Mathews, W. H., J. G. Fyles, and H. W. Nasmith
1970 Postglacial Crustal Movements in Southwestern British Columbia and Adjacent Washington State. Canadian Journal of Earth Sciences 7:690-702.

Records of former land-sea relationships in southwestern British Columbia and adjacent Washington State have been established in considerable detail by terrestrial and marine stratigraphy, by terrestrial and littoral landforms, and by archeological remains, aided by radiocarbon dating of shells, wood, peat, and charcoal from critical sites. These records indicate submergent conditions at the time of retreat of the Vashon ice sheet, 13 000 y ago, followed by an unusually quick emergence of several hundred feet by about 12 000 y ago. In the northeast and north of the area studied, this emergence was followed by a submergence of some hundreds of feet during the next half millennium preceding the Sumas ice advance. During and following this ice advance, land again became emergent, and during the period 9 000 to 6 000 y

ago sea level stood approximately 35 ft (10 m) below the present shore in some parts of the area. The shore has stood close to its present level for the last 5 500 y in all parts of the area.

Early movements were dominantly isostatic. The pre-Sumas submergence is of problematical origin. Sea level shifts since 8 000 y ago appear to be dominantly eustatic; isostatic movements were evidently essentially complete by this time. In historic time very small changes shown by tide gauges and precise levelling may be tectonic.

Location: AEU SCI QE 1 C212
Area: British Columbia - southwestern, Washington - northwestern
Topics: Sea level changes, Glacial history - Pacific margin, Stratigraphy, Tectonism

McCulloch, D. S.

1967 Quaternary Geology of the Alaskan Shore of Chukchi Sea. In *The Bering Land Bridge*, edited by D. M. Hopkins, pp. 91-120. Stanford University Press, Stanford, California.

The Quaternary history of the Alaskan shores of Chukchi Sea is primarily a history of successive marine transgressions, for it is not until the latter part of Pleistocene time that there is any record of intertransgressive intervals. Part of the interpretation of the stratigraphic record is based on the evidence that two transgressions occurred during nonglacial high-sea-level stands. This is demonstrable for the last two transgressions in the Kotzebue Sound area, where marine sediments, deposited during climates as mild as the present climate or milder, are found interbedded with glacial deposits. Although transgressive deposits can be correlated to some degree on the basis of their altitude and the extent to which their surfaces have been modified, the principal tool used to separate these deposits in any given area, and to correlate between areas, is the small but presumably significant differences in their marine molluscan faunas. Evidence for the melting of permafrost and expansion of the forest found in deposits of Sangamon and early Recent age in the Kotzebue Sound area suggests an amelioration of the climate.

Notes: Based on a Symposium held at the VII Congress of the International Association for Quaternary Research (INQUA), Boulder, Colorado, 1965.
Location: AEU SCI QE 39 H79
Area: Eastern Beringia, Alaska - western, Alaska - northern
Topics: Pollen records - Arctic margin, Plant macrofossils - wood, Tectonism, Faunal remains - Arctic margin, Stratigraphy, Sea level changes, Loess, Molluscs - marine, Periglacial features - fossil ice wedges, Plant macrofossils - twigs

McManus, D. A., and J. S. Creager

1984 Sea-Level Data for Parts of the Bering-Chukchi Shelves of Beringia from 19,000 to 10,000 14C yr B.P. Quaternary Research 21:317-325.

Sea-level changes in Beringia are especially significant because they affect the migration of land plants and animals between Asia and North America, and marine plants and animals between the Pacific and Arctic oceans. Previous studies of cores from the Bering and Chukchi shelves produced sea-level curves. Evaluation of these data suggests that nine of the radiocarbon-dated estimates of sea-level position are most reliable for the time period 19,000 to 10,000 yr B.P. The trend of these nine points is proposed as the basis for a regional sea-level curve for central Beringia. Constraints on the data must be noted, however, by anyone using them.

Location: AEU SCI QE 696 Q24
Area: Beringia, Bering-Chukchi platform
Topics: Sea level changes, Ocean cores, Beringian land bridge connection, Dating - analysis of radiocarbon dates

McManus, D. A., J. S. Creager, R. J. Echols, and M. L. Holmes

1983 The Holocene Transgression on the Arctic Flank of Beringia: Chukchi Valley to Chukchi Estuary to Chukchi Sea. In *Quaternary Coastlines and Marine Archaeology: Towards the Prehistory of Land Bridges and Continental Shelves*, edited by P. M. Masters and N. C. Flemming, pp. 365-388. Academic Press, New York, New York.

Modern assemblages of benthonic foraminifera have been used to define biofacies in 26 cores of Holocene transgressive sediments in the southern Chukchi Sea. Based on these biofacies and on radiocarbon dates that contain corrections for inactive carbon, the following sequence of events is inferred: the low sea level of the last glaciation exposed the inner and central parts of the shelf as a broad, steppe-tundra valley, down which flowed a stream system that entered the Arctic Ocean through a canyon near Wrangel Island. With rising sea level, the encroaching ocean extended quickly up the valley to form a narrow, shallow estuary (10 m deep). Although probably ice-covered almost year round, the estuary apparently received sufficient river water during brief summers to nourish an inner shelf benthonic foraminiferal assemblage. The ice cover of the estuary may not have formed a significant barrier to land migration, however. Increasing water depth brought a higher arctic assemblage comparable to that in the ice-covered East Siberian Sea today. The flooding of Bering Strait (~15,500 B.P.) and, soon after, Long Strait and the sill between Herald Shoal and Cape Lisburne (~14,600 B.P.) changed the estuary into an embayment of the Arctic Ocean with shorelines only 50-100 km from today's. The flooding of Anadyr Strait (~14,400 B.P.) terminated the land connection and joined Bering Sea water to the Chukchi Sea along a narrow passage through which came a lower arctic assemblage. Approximately 13,500 B.P. an assumed dramatic warming of the climate accelerated the melting of nearby glaciers and the accumulation of sediment in a possibly turbid sea. On the flooding of the final sill, Shpanberg Strait (~12,000 B.P) warm water entered the Chukchi Sea from the Bering Strait in abundance, bearing a lower arctic assemblage and silt from the Yukon River. Since then, the water circulation has been essentially unchanged, around lower capes that may have served as habitation sites like similar ones today. Approximately 5,000 years ago a mixed assemblage appeared, suggesting more episodes of southerly transport of water through Bering Strait. Throughout this time the deltas of the Noatak and Kobuk rivers migrated 200 km southeast with rising sea level to their present positions. These deltas, like other coastal features in the southeast Chukchi Sea, can be followed seaward from their present sites and back in time over much of the Holocene transgression.

Location: AEU HSS GN 741 Q22
Area: Chukchi Sea, Kotzebue Sound, Bering-Chukchi platform
Topics: Sea level changes, Palaeochannels, Diatoms, Foraminifera, Stratigraphy, Pollen records - Arctic margin, Tectonism, Ocean cores, Sedimentation rates

Nasmith, H.

1970 Pleistocene Geology of the Queen Charlotte Islands and Southern British Columbia. In *Early Man and Environments in Northwest North America*, edited by R. A. Smith and J. W. Smith, pp. 5-8. University of Calgary Archaeological Association, Calgary, Alberta.

Location: AEU HSS E 77.8 E12
Area: British Columbia - Queen Charlotte Islands, British Columbia - southwestern
Topics: Glacial history - Pacific margin, Sea level changes

Porter, S. C.

1970 Glacier Recession in the Southern and Central Puget Lowland, Washington, between 14,000 and 13,000 Years B.P. In *AMQUA, 1st Biennial Meeting, Abstracts*, p. 107.

Location: AEU HSS QE 696 A52
Area: Washington - northwestern
Topics: Glacial history

Scholl, D. W., and C. L. Sainsbury

1961 Subaerially Carved Arctic Seavalley Under a Modern Epicontinental Sea. Geological Society of America Bulletin 72:1433-1436.

A shallow seavalley, averaging 6 feet in relief, extends from the mouth of Ogotoruk Creek, northwest Alaska, for 15 miles across the floor of the Chukchi Sea to a depth of 135 feet. The seavalley is considered to be a drowned subaerial valley of Pleistocene age, which was excavated on an eustatically emerged epicontinental shelf during periods of glacially depressed sea level.

Location: AEU SCI QE 1 G341
Area: Chukchi Sea, Alaska - northwestern
Topics: Palaeochannels

Smith, P.

1985 Late Quaternary Geology of the Beaufort Sea Inner Shelf near Prudhoe Bay. In *The United States Geological Survey in Alaska: Accomplishments During 1983*, edited by S. Bartsch-Winkler and K. M. Reed, pp. 100-103. Circular 945. United States Geological Survey.

Location: AEU SCI QE 75 C57
Area: Beaufort Sea, Alaska - northern
Topics: Ocean cores, Sea level changes, Stratigraphy

Thorson, R. M.

1980 Ice-Sheet Glaciation of the Puget Lowland, Washington, During the Vashon Stade (Late Pleistocene). Quaternary Research 13:303-321.

During the Vashon Stade of the Fraser Glaciation, about 15,000-13,000 yr B.P., a lobe of the Cordilleran Ice Sheet occupied the Puget lowland of western Washington. At its maximum extent about 14,000 yr ago, the ice sheet extended across the Puget lowland between the Cascade Range and Olympic Mountains and terminated about 80 km south of Seattle. Meltwater streams drained southwest to the Pacific Ocean and built broad outwash trains south of the ice margin. Reconstructed longitudinal profiles for the Puget lobe at its maximum extent are similar to the modern profile of Malaspina Glacier, Alaska, suggesting that the ice sheet may have been in a near-equilibrium state at the glacial maximum. Progressive northward retreat from the terminal zone was accompanied by the development of ice-marginal streams and proglacial lakes that drained southward during initial retreat, but northward during late Vashon time. Relatively rapid retreat of the Juan de Fuca lobe may have contributed to partial stagnation of the northwestern part of the Puget lobe. Final destruction of the Puget lobe occurred when the ice retreated north of Admiralty Inlet. The sea entered the Puget lowland at this time, allowing the deposition of glacial-marine sediments which now occur as high as 50 m altitude. These deposits, together with ice-marginal meltwater channels presumed to have formed above sea level during deglaciation, suggest that a significant amount of postglacial isostatic and(or) tectonic deformation has occurred in the Puget lowland since deglaciation.

Location: AEU SCI QE 696 Q24
Area: Washington - northwestern
Topics: Glacial history, Glacial dynamics, Glacial geomorphology, Stratigraphy, Tectonism, Ice limit reconstruction, Sea level changes, Glacial lake sequences

1986 Glacial Dynamics and Interactions between Marine and Terrestrial Sectors of the Southern Cordilleran Ice Sheet: The Puget-Juan De Fuca System. In *AMQUA, 9th Biennial Meeting, Champaign, Illinois, Program and Abstracts*, pp. 23-25.

Location: AEU HSS QE 696 A5212
Area: Washington - western, British Columbia - southwestern
Topics: Glacial history, Glacial dynamics, Sea level changes

PART 2. LATE QUATERNARY PALAEOENVIRONMENTS

Alley, N. F.

1979 Middle Wisconsin Stratigraphy and Climatic Reconstruction, Southern Vancouver Island, British Columbia. Quaternary Research 11:213-237.

Interbedded, organic-rich terrestrial and marine sediments exposed along the eastern coastal lowland of Vancouver Island contain an almost continuous record of middle Wisconsin vegetation and climate. The record has been interpreted largely from palynostratigraphic studies at three sites and supported by a study of modern pollen spectra from the three major biogeoclimatic zones of the extant vegetation. Radiocarbon dates from a variety of organic materials in the middle Wisconsin beds reveal that the fossil pollen spectra span an interval ranging from approximately 21,000 yr B.P. to more than 51,000 yr B.P. The spectra are divided into eight major pollen zones encompassing the Olympia Interglaciation and early Fraser Glaciation geologic-climate units of the Pacific Northwest. The Olympia Interglaciation extended from before 51,000 yr B.P. to ca. 29,000 yr B.P. and was characterized by a climate similar to present. During the early Fraser Glaciation, from 29,000 years ago to approximately 21,000 yr B.P., climate deteriorated until tundra like conditions prevailed. These pollen sequences are correlative with those of coastal British Columbia and partly with those from Olympic Peninsula, but apparently are not comparable with events in the Puget Lowland.

Location: AEU SCI QE 696 Q24
Area: British Columbia - southwestern
Topics: Stratigraphy, Glacial history - Pacific margin, Pollen analysis - Pacific margin, Plant macrofossils - wood, Plant macrofossils - peat, Vegetation history - Pacific margin, Climate history - Pacific margin, Molluscs - marine, Palynological sites - Dashwood, Palynological sites - Skutz Falls, Palynological sites - Cordova Bay, Pollen analysis - modern pollen spectra, Dinoflagellates

Baldauf, J. G.

1982 Identification of the Holocene-Pleistocene Boundary in the Bering Sea by Diatoms. Boreas 11:113–118.

The modern diatom flora from surface sediment of the Navarin Basin region of the Bering Sea is dominated by *Denticulopsis seminae* and *Nitzschia oceanica*. *D. seminae*, a north boreal species, is most abundant in the deeper waters of the slope-basin regions, whereas *N. oceanica*, an Arctic species associated with ice cover, dominates the shallow shelf waters. Downcore studies show that these species alternate in dominance within the late Quaternary sediments. This alternation suggests responses to climatic fluctuations. The interval at which *D. seminae* is replaced downcore by *N. oceanica* in dominating the assemblage is distinct and can be correlated in cores throughout the study area as well as adjacent regions. This interval represents the transition from glacial to interglacial conditions and the Holocene-Pleistocene boundary.

Location: AEU SCI QE 696 B73
Area: Bering Sea
Topics: Diatoms, Ocean cores, Stratigraphy

Barnosky, C. W.

1981 A Record of Late Quaternary Vegetation from Davis Lake, Southern Puget Lowland, Washington. Quaternary Research 16:221-239.

Pollen and macrofossil analyses of a core spanning 26,000 yr from Davis Lake reveal late Pleistocene and Holocene vegetational patterns in the Puget Lowland. The core ranges lithologically from a basal inorganic clay to a detritus gyttja to an upper fibrous peat and includes eight tephra units. The late Pleistocene pollen sequence records two intervals of tundra-parkland vegetation. The earlier of these has high percentages of *Picea*, Gramineae, and *Artemisia* pollen and represents the vegetation during the Evans Creek Stade (Fraser Glaciation) (ca. 25,000-17,000 yr B.P.). The later parkland interval is dominated by *Picea*, *Tsuga mertensiana*, and Gramineae. It corresponds to the maximum ice advance in the Puget Lowland during the Vashon Stade (Fraser Glaciation) (ca. 14,000 yr B.P.). An increase in *Pinus contorta* pollen between the two tundra-parkland intervals suggests a temporary rise in treeline during an unnamed interstade. After 13,500 yr B.P., a mixed woodland of subalpine and lowland conifers grew at Davis Lake during a period of rapid climatic

amelioration. In the early Holocene, the prolonged expansion of *Pseudotsuga* and *Alnus* woodland suggests dry, temperate conditions similar to those of present rainshadow sites in the Puget Lowland. More-mesic [sic] forests of *Tsuga heterophylla*, *Thuja plicata*, and *Pseudotsuga*, similar to present lowland vegetation, appeared in the late Holocene (ca. 5500 yr B.P.).

Location: AEU SCI QE 696 Q24
Area: Washington - northwestern
Topics: Palynological sites - Davis Lake, Lake cores, Tephra - Mazama, Tephra - Washington, Pollen analysis - modern pollen spectra, Pollen analysis - Pacific margin, Vegetation history - Pacific margin, Glacial history - Pacific margin, Plant macrofossils, Climate history - Pacific margin

1986 Vegetation and Climate of the Puget Trough During the Advance and Retreat of the Puget Lobe. In *AMQUA, 9th Biennial Meeting, Champaign, Illinois, Program and Abstracts*, pp. 26-27.

Location: AEU HSS QE 696 A5212
Area: Washington - western
Topics: Plant migration, Pollen analysis - Pacific margin, Insect macrofossils, Climate history - Pacific margin, Vegetation history - Pacific margin

Black, R. F.

1981 Late Quaternary Climatic Changes in the Aleutian Islands, Alaska. In *Quaternary Paleoclimate*, edited by W. C. Mahaney, pp. 47-62. Geo Abstracts, Norwich, England.

Late Quaternary climatic changes in the Aleutian Islands are recorded by: 1) destruction of ice caps on all major islands; 2) subsequent aperiodic advances and retreats of alpine glaciers; 3) changes in the perennial snowline as suggested by cirques and alpine wind work; 4) floristic changes shown by pollen in bogs; and 5) activity of gravity movements, particularly solifluction phenomena and possible cryoturbations. The lower limits of mean paleotemperatures are suggested by: 1) strandflat organisms left in Aleut "kitchen middens"; and 2) absence of permafrost indicators. Direction of paleowinds is given by: 1) orientation of ancient sand dunes, ventifacts, and blow outs; 2) littoral drift features; and 3) distribution of tephra.

A radiocarbon-dated, soil-tephra sequence documents the major events: 1) ice-cap deglaciation 12,000-10,000 BP; 2) major alpine glacier advances in the general intervals 7500-5500 and 3500-2000 BP; and 3) a Hypsithermal Interval peaking about 5500-3500 BP. Summers are and have been shorter, cooler, and wetter in the western Aleutians than in the eastern, in part a consequence of a more marine environment versus a more continental one and outpouring of cold Arctic air from Siberia.

The major changes of climate in the Aleutian Islands are accompanied by major changes in the intensity and position of the Aleutian low, an area of low pressure often centering on or just south of the Aleutian Islands. That low is controlled in part by the temperature of the north Pacific Ocean waters *vs.* the colder Bering Sea. The dominant westerlies are intensified in winter, especially with Arctic air, and probably were throughout the years of glacial advances. Marked changes in the climate of the Aleutians are accompanied or followed by changes in the climate elsewhere.

Location: AEU SCI QC 884 Q25
Area: Aleutian Islands, Alaska - southwestern
Topics: Climate reconstruction, Palynological sites - Umnak Island, Palynological sites - Adak Island, Pollen records - Pacific margin, Glacial history - Pacific margin, Tephra - Alaska, Palaeowinds, Geomorphology

Brouwers, E. M.

1990 *Systematic Paleontology of Quaternary Ostracode Assemblages from the Gulf of Alaska, Part 1: Families Cytherellidae, Bairdiidae, Cytheridae, Leptocytheridae, Limnocytheridae, Eucytheridae, Krithidae, Cushmanideidae.* Professional Paper 1510. United States Geological Survey. 43 pp.

Thirty-two species of podocopid ostracodes are reported from Quaternary sediments of the Gulf of Alaska continental shelf. Fifteen new species are described (*Neonesidea sitkagi*, *Cytheromorpha eskerensis*, *C. grandwashensis*, *C. molniai*, *Munseyella melzeri*, *M. ristveti*, *Pectocythere janae*, *P. kiklukhensis*, *P. marincovichi*, *P. tsiuensis*, *Cluthia foresteri*, *Krithe burkholderi*, *K. adelspergi*, *Pontocythere dahlgrenensis*, *P. jefferiesensis*), twelve previously described species are illustrated, and five species are placed in open nomenclature.

Location: AEU SCI QE 75 P96
Area: Alaska - southeastern, Pacific Ocean - northeastern
Topics: Zoogeography - ostracodes, Ostracodes, Tectonism, Taxonomy - ostracodes

Colinvaux, P. A.
1967 Bering Land Bridge: Evidence of Spruce in Late-Wisconsin Times. Science 156:380-383.

A 14-meter core from a crater lake on Saint Paul Island in the Pribilofs has been examined by pollen analysis. Radiocarbon dating indicates that the core spans more than 10,000 years and probably more than 18,000 years. A spruce-pollen maximum about 10,000 years ago suggests that spruce advanced to the flanks of the southern coast of the Bering land bridge toward the close of the land-bridge period. The forests of Alaska and Siberia did not merge, however, and the environment of the southern coast of the land bridge remained cold.

Location: AEU SCI Q 1 S41
Area: Pribilof Islands, Bering-Chukchi platform, Eastern Beringia
Topics: Dating - analysis of radiocarbon dates, Palynological sites - Cagaloq Lake (formerly Lake Hill Lake), Beringian vegetation, Pollen analysis - Pacific margin, Vegetation history - *Picea*

Colinvaux, P.
1981 Historical Ecology in Beringia: The South Land Bridge Coast at St. Paul Island. Quaternary Research 16:18-36.

A 14-m core of lake sediments from St. Paul Island yields a long environmental history of the south coast of the Bering land bridge. Tritium assay demonstrates that sands in the bottom 8 m of deposit are injected with modern water, suggesting that a radiocarbon anomaly is the result of modern carbon introduced in groundwater. The remaining radiocarbon chronology, coupled with a time-stratigraphic pollen-zone boundary suggests that the record penetrates to the mid-Wisconsin interstadial. Pollen percentage data, *Picea* pollen influx, and pollen species lists allow reconstruction of the land bridge vegetation, which was tundra, without shrubs or trees, with bare ground, and comparable to Bering land bridge tundras found further north. There was no coastal mild or wet strip. Plant associations comparable to those of the modern Aleutians or Pribilofs probably did not exist along the land bridge coast and the region was probably not suitable for breeding by fur seals and other marine mammals. A cold, dry, continental air-mass system reached to the coast itself. The south land bridge coast did not offer an environment to aboriginal human populations that was significantly milder than that of the land bridge plains to the north. At about 11,000 yr B.P. the Wisconsin dry climate was replaced by a regimen comparable to that at the modern tree line of the interior, and this climate in turn was replaced with the modern system at about 9500 yr B.P. Climatic change was independent of fluctuating sea level.

Location: AEU SCI QE 696 Q24
Area: Alaska - southwestern, Pribilof Islands
Topics: Beringian ecology, Pollen analysis - Pacific margin, Vegetation history - Pacific margin, Climate history - Pacific margin, Stable isotopes - tritium, Sea level changes, Beringian land bridge connection, Palynological sites - Cagaloq Lake (formerly Lake Hill Lake), Pollen analysis - modern pollen spectra, Beringian vegetation, Vegetation history - *Picea*

Elias, S. A.
1992 Bering Land Bridge Insect Fossils, Chukchi Sea Shelf, NW Alaska: Evidence for Late Glacial Warming Synchronous with Land Bridge Inundation. In *AMQUA, 12th Biennial Meeting, Davis, California, Program and Abstracts*, p. 40.

Area: Chukchi Sea
Topics: Insect macrofossils - beetles, Climate history - Arctic margin, Sea level changes, Plant macrofossils - peat, Plant macrofossils - *Populus*, Ocean cores, Ostracodes, Beringian land bridge connection

Elias, S. A., S. K. Short, and R. L. Phillips
1992 Paleoecology of Late-Glacial Peats from the Bering Land Bridge, Chukchi Sea Shelf Region, Northwestern Alaska. Quaternary Research 38:371-378.

Insect fossils and pollen from late Pleistocene nonmarine peat layers were recovered from cores from the shelf region of the Chukchi Sea at depths of about 50 m below sea level. The peats date to 11,300-11,000 yr B.P. and provide a limiting age for the regional Pleistocene-Holocene marine transgression. The insect fossils are indicative of arctic coastal habitats like those of the Mackenzie Delta region (mean July temperatures = 10.6-14°C) suggesting that 11,000 yr ago the exposed Chukchi Sea shelf had a climate substantially warmer than modern coastal regions of the Alaskan north slope. The pollen spectra are consistent with the age assignment to the Birch Interval (14,000-9000 yr B.P.). The data suggest a meadow-like graminoid tundra with birch shrubs and some willow shrubs growing in sheltered areas.

Notes: Paper suggests much later inundation of Bering platform than previous studies.
Location: AEU SCI QE 696 Q24
Area: Eastern Beringia, Chukchi Sea
Topics: Ocean cores, Pollen analysis - Arctic margin, Vegetation history - Arctic margin, Plant macrofossils - peat, Climate history - Arctic margin, Insect macrofossils - beetles, Stratigraphy, Ostracodes, Zoogeography - beetles, Dating - analysis of radiocarbon dates, Dating - contamination problems, Sea level changes

Fedje, D. W.
1993 *Sea-Levels and Prehistory in Gwaii Haanas.* Unpublished M. A. dissertation. Department of Archaeology, University of Calgary, Calgary, Alberta. xii + 160 pp.

Integration of palynology and micropaleontology in an analysis of sediment cores and stratigraphic sections from the Gwaii Haanas Archipelago (southern Moresby Island) and adjacent Hecate Strait allows improved detailing of the sea-level curve for Haida Gwaii (Queen Charlotte Islands). Transgressive and regressive events are established through analysis of several types of microfossils including pollen, dinocysts, diatoms, foraminifera and thecamoebians. This research shows that the early Holocene marine transgression in this area was very rapid. Mean sea level reached a maximum elevation of approximately 14 metres above present levels at about 9,000 years ago and relative sea-levels remained between 12.5 and 14 metres elevation above present levels until about 5,500 years ago. These results are highly significant in the search for and meaning of early archaeological sites in this area.

Area: British Columbia - Queen Charlotte Islands
Topics: Pollen analysis - Pacific margin, Sea level changes, Diatoms, Dinoflagellates, Foraminifera, Archaeological sites - Queen Charlotte Islands

Florer, L. E.
1972 Quaternary Paleoecology and Stratigraphy of the Sea Cliffs, Western Olympic Peninsula, Washington. Quaternary Research 2:202-216.

The sea cliffs of the western Olympic Peninsula are composed chiefly of discontinuous beds of unconsolidated gravel, sand, silt, and peat of Pleistocene age. Two lower stratigraphic units, the "Steamboat Creek gravel" and "Joe Creek silt," were deposited probably during the Puyallup Interglaciation; the upper unit, the "Kalaloch silt," was deposited during an interval that extends from Salmon Springs Glaciation through Fraser Glaciation. Radiocarbon dates of the Kalaloch silt range from about 17,000 to > 48,000 BP.

Pollen analysis and stratigraphic correlation of the sea cliff sediments indicate that the present vegetation of the Olympic Peninsula has existed in this part of western Washington since the Puyallup Interglacial. During the Puyallup, the low elevation *Tsuga heterophylla-Picea* forest or its seral stages were predominant. During subsequent glaciations the low elevation forest was replaced by montane or alpine plant communities in areas near the ice front. At sites farther

removed from glacial termini, low elevation forest apparently persisted, thriving in centers from which constituent species spread during interstadials.

Location: AEU SCI QE 696 Q24
Area: Washington - northwestern
Topics: Palynological sites - Kalaloch, Pollen analysis - modern pollen spectra, Stratigraphy, Glacial history - Pacific margin, Vegetation history - Pacific margin, Pollen analysis - Pacific margin, Climate history - Pacific margin, Plant macrofossils - peat

Fuji, N.

1984 Paleogeography of the Oldest Yoshihara Submarine Forest in Toyama Bay, Japan. In *6th International Palynological Conference, Calgary, Abstracts*, p. 50.

Area: Japan
Topics: Pollen analysis, Plant macrofossils - wood, Sea level changes, Climate history, Vegetation history

Gorbarenko, S. A.

1991 Paleoceanology of the Okhotsk, Japan and East-China Seas During Last 50 000 Years. In *INQUA, 13th International Congress, Beijing, China, Abstracts*, p. 116.

Area: Pacific Ocean - northwestern
Topics: Ocean cores, Foraminifera, Sea level changes

Hebda, R. J.

1983 Late-Glacial and Postglacial Vegetation History at Bear Cove Bog, Northeast Vancouver Island, British Columbia. Canadian Journal of Botany 61:3172-3192.

At 13 630 ± 310 BP (WAT-721) Port Hardy is the earliest area known to have been deglaciated at the end of the Fraser Glaciation on Vancouver Island. Pollen and macrofossil analyses of two cores from a basin-blanket bog show that about 14 000 years ago *Pinus contorta*, *Alnus*, and *Pteridium aquilinum* formed pioneering vegetation typical of post-ice environments on the Pacific Northwest coast. Climate is interpreted to have been relatively cool and dry. *Picea sitchensis* - *Tsuga mertensiana* forest succeeded at about 11 500 BP and persisted until about 10 000 BP. Climate was cool, moist, and maritime. Warming at about 10 000 BP permitted *Tsuga heterophylla* gradually to replace *T. mertensiana*. At 8800 BP *Pseudotsuga menziesii* migrated into the area and together with *P. sitchensis* dominated the forest. Abundant *Pteridium aquilinum* spores suggest forests were open. During the interval 8800 to 7000 BP the climate was warmer and drier than at present because today forests with *Pseudotsuga* do not extend as far north as Port Hardy. During this warm time, shallow ponds dried out. By 7000 BP *Pseudotsuga* declined and *T. heterophylla* and *P. sitchensis* dominated forests. Climate became wetter and cooler than in the preceding period but not as cool as today. About 3000 BP Cupressaceae, presumably both *Thuja plicata* and *Chamaecyparis nootkatensis*, shared the forest canopy with *T. heterophylla*. *Sphagnum* growth and bog development occurred after 7000 BP as climate became moister. The vegetation sequence described is a "maritime" type similar to sequences on the west coast of Washington State but unlike those from the Fraser Lowland. The xerothermic interval was of short duration between 8800 and 7000 BP but was expressed clearly in this area of moist maritime climate and therefore must have been of considerable amplitude. Vegetation differences between coastal and inland southwestern British Columbia were established by 11 500 BP.

Location: AEU SCI QK 1 C21
Area: British Columbia - southwestern
Topics: Palynological sites - Bear Cove Bog, Pollen analysis - Pacific margin, Pollen analysis - modern pollen spectra, Sea level changes, Tectonism, Molluscs - marine, Vegetation history - Pacific margin, Vegetation history - *Pinus*, Vegetation history - *Picea*, Vegetation history - *Alnus*, Plant macrofossils - peat, Plant macrofossils - needles, Plant macrofossils - *Nuphar lutea*, Plant macrofossils - *Potamogeton*, Glacial history - Pacific margin

Heusser, C. J.

1972 Palynology and Phytogeographical Significance of a Late-Pleistocene Refugium Near Kalaloch, Washington. Quaternary Research 2:189-201.

A sea cliff facing the open ocean 3 km north of Kalaloch, Washington, and exposing 32 m of interbedded peat, clay, sand, and gravel contains a unique continuous record of late-Pleistocene vegetation and environments on the western side of the Olympic Peninsula. The record obtains from the palynology of plant communities in the unglaciated refugium. Fourteen radiocarbon dates from peat beds in the sea cliff reveal that the record spans the time from 16,700 B. P. to greater than 47,000 B. P. The earliest organic deposits are estimated to date from 70,000 B. P. Pollen assemblages from 222 sample levels in a measured section, divided into 16 zones, are correlated, in the main, with the sequence of Salmon Springs, Olympia, and Fraser geologic-climatic units in the Puget Lowland. Correlation derives from the fluctuations of a July average temperature curve reconstructed from the modern vegetation and climatic equivalents of the pollen assemblages. The sequence of stadial and interstadial environments depicted at Kalaloch is found to be more complex than is indicated by the Puget Lowland succession.

Location: AEU SCI QE 696 Q24
Area: Washington - northwestern
Topics: Palynological sites - Kalaloch, Climate reconstruction, Refugia, Pollen analysis - Pacific margin, Vegetation history - Pacific margin, Climate history - Pacific margin, Stratigraphy, Plant macrofossils - peat, Treeline fluctuations - alpine

1973 Environmental Sequence Following the Fraser Advance of the Juan de Fuca Lobe, Washington. Quaternary Research 3:284-306.

Stratigraphic palynology and radiocarbon chronology of two bogs and a lake on the northwestern Olympic Peninsula serve to record the environmental sequence postdating the Fraser maximum of the Juan de Fuca lobe. Wastage of the lobe in the terminal area began before 14,460 ± 200 BP. Differential downwasting followed, and the last remnants of dead ice probably disappeared some time before 9,380 ± 180 BP. Ablation moraine became sufficiently thick in the course of wastage for a vegetation cover to become established. Arboreal remains of this cover, found buried in till, date between 12,020 ± 210 and 13,380 ± 250 BP.

Communities of *Pinus contorta* first succeeded on deglaciated surfaces during the Vashon Stade. Environmental conditions were comparable to those prevailing in the modern subalpine forest, and average July temperature stood near 12°C. Later, during the Everson Interstade (11,000-13,000 BP.), *Alnus* and *Picea* multiplied as temperature increased possibly to as much as 14°. During the Sumas Stade (10,000-11,000 BP.), temperature was again ca. 12°, the cooler climate halting wastage and the spread of *Alnus* and enabling communities of *Picea*, *Tsuga heterophylla*, and *T. mertensiana* to temporarily achieve stability.

Postglacial environments through the Hypsithermal (ca. 3,000 BP.) were dominated principally by *Alnus*. *Alnus*, succeeded in turn by *Picea*, invaded the landscape, following the recession of alpine glaciers and the rise in elevation of the snowline. For a time, as suggested by a peak of *Pseudotsuga*, temperature may have reached close to 17° and annual precipitation less than 760 mm. Arboreal communities were relatively open while light-requiring *Pteridium* remained conspicuous in the record. After 3,000 BP during Neoglaciation, climate became sufficiently cool and moist to favor the development of extensive, closed communities of *Tsuga*, *Picea*, *Thuja*, and other hygrophilous species.

Location: AEU SCI QE 696 Q24
Area: Washington - northwestern
Topics: Peat cores, Lake cores, Palynological sites - Wessler Bog, Sea level changes, Climate reconstruction, Glacial history - Pacific margin, Glacial geomorphology, Stratigraphy, Plant macrofossils, Pollen analysis - Pacific margin, Vegetation history - Pacific margin, Climate history - Pacific margin, Palynological sites - Washington - northwestern

1977 Quaternary Palynology of the Pacific Slope of Washington. Quaternary Research 8:282-306.

Quaternary deposits on the Pacific slope of Washington range in age from the earliest known interglaciation, the Alderton, through the Holocene. Pollen stratigraphy of these deposits is represented by 12 major pollen zones and is ostensibly continuous through Zone 8 over more than 47,000 radiocarbon yr. Before this, the stratigraphy is discontinuous and the chronology less certain. Environments over the time span of the deposits are reconstructed by the comparison of fossil and modern pollen assemblages and the use of relevant meteorological data. The Alderton Interglaciation is characterized by forests of Douglas fir (*Pseudotsuga menziesii*), alder (*Alnus*), and fir (*Abies*). During the next younger interglaciation, the Puyallup, forests were mostly of pine, apparently lodgepole (*Pinus contorta*), except midway in the interval when fir, western hemlock (*Tsuga heterophylla*), and Douglas fir temporarily replaced much of the pine. Vegetation outside the limits of Salmon Springs ice (>47,000-34,000 yr BP) varied chiefly between park tundra and forests of western hemlock, spruce (*Picea*), and pine. The Salmon Springs nonglacial interval at the type locality records early park tundra followed by forests of pine and of fir. During the Olympia Interglaciation (34,000-28,000 yr BP), pine invaded the Puget Lowland, whereas western hemlock and spruce became manifest on the Olympic Peninsula. Park tundra was widespread during the Fraser Glaciation (28,000-10,000 yr BP) with pine becoming more important from about 15,000 to 10,000 yr BP. Holocene vegetation consisted first of open communities of Douglas fir and alder; later, closed forest succeeded, formed principally of western hemlock on the Olympic Peninsula and of western hemlock and Douglas fir in the Puget Lowland. Over the length of the reconstructed environmental record, climate shifted between cool and humid or relatively warm, semihumid forest types and cold, relatively dry tundra or park tundra types. During times of glaciation, average July temperatures are estimated to have been at least 7°C lower than today. Only during the Alderton Interglaciation and during the Holocene were temperatures higher for protracted periods than at present.

Location: AEU SCI QE 696 Q24
Area: Washington - northwestern
Topics: Pollen analysis - modern pollen spectra, Climate reconstruction, Tephra - Washington, Glacial history, Palynological sites - Kalaloch, Palynological sites - Hoh Valley, Pollen analysis - Pacific margin, Vegetation history - Pacific margin, Climate history - Pacific margin

1985 Quaternary Pollen Records from the Pacific Northwest Coast: Aleutians to the Oregon-California Boundary. In *Pollen Records of Late-Quaternary North American Sediments*, edited by V. M. Bryant Jr. and R. G. Holloway, pp. 141-165. American Association of Stratigraphic Palynologists Foundation, Dallas, Texas.

Quaternary sediments of lakes and mires in the glaciated portion of the North Pacific coast were deposited, for the most part, following Late Wisconsin wastage of the Cordilleran Glacier Complex. Some sequences in western Washington are older, covering time spans since the Early Wisconsin, and a few are of earlier interglaciations. Selected for geographic location and length of continuous sedimentation are 20 pollen records from sites distributed between Alaskan tundra and Pacific coastal forest of Washington and Oregon.

Pollen records dating back to the Early Wisconsin in Washington contrast assemblages of tundra, parkland, and closed coastal forest. Assemblages show response of vegetation to stadial and interstadial climatic and edaphic conditions. Tree line in the Pleistocene apparently fluctuated across southwestern Washington and during the Holocene advanced to higher latitudes in Alaska and to higher altitudes in the cordillera. Advance of forest northwestward along the coast was from unglaciated refugia located in Washington and possibly in the Queen Charlotte Islands of British Columbia and other places along the Pacific slope. Lodgepole pine and alder invaded deglaciated ground in British Columbia and southeast Alaska during the late-glacial and were followed in the Holocene by Sitka spruce, western hemlock, and mountain hemlock, which within approximately the past 2,000-3,000 years reached southcentral Alaska. Advance of alder and spruce into tundra on Kodiak Island and southwestward is an apparent recent event.

Transfer functions calibrate temperature and precipitation for Quaternary pollen records from western Washington and British Columbia. Trends indicate relatively warm, wet intervals at >47,000 and around 30,000 yrs. B.P. and coldest and driest conditions between 28,000 and 13,000 yrs. B.P. Holocene warmth and dryness became pronounced about 8,000 years ago, after which climate was colder and more humid. During earlier interglaciations, temperatures comparable to the Holocene are evident in records of the Alderton and Whidbey Formations, whereas the record of temperature for the Puyallup Formation is about 2°C lower than for the Holocene.

Location: AEU SCI QE 993.2 P773, AEA PMA/ASA 561.13 P763
Area: Aleutian Islands, Alaska - southwestern
Topics: Review of pollen records - Pacific coast, Tephra - Eastern Beringia, Pollen analysis - modern pollen spectra, Climate reconstruction, Plant macrofossils, Sea level changes

Heusser, C. J., and L. E. Florer
1973 Correlation of Marine and Continental Quaternary Pollen Records from the Northeast Pacific and Western Washington. Quaternary Research 3:661-670.

Late-glacial and postglacial pollen stratigraphy and radiocarbon chronology of a marine core from the continental slope and a core from the western Olympic Peninsula, ca. 110 km apart, are compared. Divisible into four pollen assemblage zones (L, P-1, P-2, and P-3), the cores exhibit a succession of correlative zonal prominences: grass-sedge (L), pine (P-1), alder (P-1—P-2 boundary), and hemlock (P-3). Volcanic ash of Mt. Mazama provenance is also correlative in zone P-2. Quantitative relationships of the pollen in the cores (relative and absolute numbers and pollen influx) are dissimilar, however, and are attributed to the influence of the Columbia River pollen load reaching the locale of the continental slope core compared with the local pollen rain influencing the Olympic Peninsula core site.

Location: AEU SCI QE 696 Q24
Area: Washington - northwestern
Topics: Tephra - Mazama, Peat cores, Palynological sites - Hoh Valley, Ocean cores, Pollen analysis - Pacific margin, Vegetation history - Pacific margin

Heusser, C. J., L. E. Heusser, and S. S. Streeter
1980 Quaternary Temperatures and Precipitation for the North-West Coast of North America. Nature 286:702-704.

Palynologists utilize present-day pollen rain to interpret the climatic setting of pollen records from Quaternary deposits. Analogues are sought which relate the present with the past. Because climatic conditions at mid-latitudes during the Quaternary were diverse, often ranging from a tundra type at one extreme to a closed forest type at the other, a modern data set should cover the extremes of vegetation and climate expected during this time. For interpreting climatic parameters from Quaternary pollen in land and marine cores, we calculated a pair of regression equations relating modern pollen rain from the Pacific coastal forest and tundra to mean July temperature and mean annual precipitation at a series of sites from the Aleutian Islands to northern California. We describe here how application of these equations to Quaternary pollen profiles from western Washington enabled us to quantify temperature and precipitation over the past ~80,000 yr.

Location: AEU SCI Q 1 N28
Area: Aleutian Islands, Washington - western, British Columbia - western, Alaska - southern
Topics: Palynological sites - Hoh Valley, Palynological sites - Kalaloch, Climate reconstruction, Pollen analysis - modern pollen spectra, Climate history - Pacific margin, Vegetation history - Pacific margin, Pollen records - Pacific margin

Heusser, L. E.
1985 Quaternary Palynology of Marine Sediments in the Northeast Pacific, Northwest Atlantic, and Gulf of Mexico. In *Pollen Records of Late-Quaternary North American Sediments*, edited by V. M. Bryant Jr. and R. G. Holloway, pp. 385-403. American Association of Stratigraphic Palynologists Foundation, Dallas, Texas.

This review of Quaternary marine palynology of North America, a 30-year old discipline, summarizes published and unpublished data from the Gulf of Mexico, Gulf of California, northwest North Atlantic, and northeast North Pacific Oceans. Results from the last ten years confirm and expand earlier observations regarding marine pollen sedimentation and stratigraphy. Empirical studies of pollen distribution in surface sediments on the continental margin include ~600 samples. Pollen analyses from forty cores yield correlative marine and terrestrial environmental data from the past 30,000 years. Two cores cover the last 90,000 years and nine cores extend past 900,000 years. Several studies use new

techniques, principal component analysis and regression equations, to synthesize and calibrate marine pollen data, or are multidisciplinary approaches which integrate marine palynology, geochemistry, micropaleontology, and sedimentology.

Location: AEU SCI QE 993.2 P773, AEA PMA/ASA 561.13 P763
Area: Pacific Ocean - northeastern
Topics: Ocean cores, Review of pollen analyses - continental shelf of North America, Pollen analysis - modern pollen spectra, Pollen analysis - multivariate statistics, Foraminifera, Radiolaria, Diatoms, Climate reconstruction, Stable isotopes - $\delta^{18}O$

Heusser, L. E., and J. J. Morely [sic]

1984 Quaternary Environments of Northeastern Asia: 140,000 Years of Climate Records from Japan and Adjacent Seas. In *AMQUA, 8th Biennial Meeting, Boulder, Colorado, Program and Abstracts*, p. 60.

Area: Pacific Ocean - northwestern
Topics: Climate history - Pacific margin, Ocean cores, Pollen analysis - Pacific margin, Vegetation history - Japan, Radiolaria, Sea surface temperature

Heusser, L. E., and J. J. Morley

1985 Pollen and Radiolarian Records from Deep-Sea Core RC14-103: Climatic Reconstructions of Northeast Japan and Northwest Pacific for the Last 90,000 Years. Quaternary Research 24:60-72.

Using modern pollen and radiolarian distributions in sediments from the northwest Pacific and seas adjacent to Japan to interpret floral and faunal changes in core RC14-103 (44°02'N, 152°56'E), we recognize two major responses of the biota of eastern Hokkaido and the northwest Pacific to climatic changes since the last interglaciation. Relatively stable glacial environments (~80,000-20,000 yr B.P.) were basically cold and wet (<4°C and ~1000 mm mean annual temperature and precipitation, respectively) with boreal conifers and tundra/park-tundra on Hokkaido, and cool (<16°C) summer and cold (<1.0°C) winter surface temperatures offshore. Contrasting nonglacial environments (~10,000-4000 yr B.P.) were warm and humid (>8°C and >1200 mm mean annual temperature and precipitation, respectively), supporting climax broadleaf deciduous forest with *Quercus* and *Ulmus/Zelkova*, with surface waters in the northwest Pacific characterized by warm (>1.5°C) winter and cold (10.4°-14.3°C) summer temperatures. Climatic evidence from RC14-103 shows a high degree of local and regional variation within the context of global climatic change. Correlative ocean and land records provide the detailed input necessary to assess local/regional responses to variations in other key elements (i.e., solar radiation, monsoonal variations) of the northeast Asian climate system.

Location: AEU SCI QE 696 Q24
Area: Pacific Ocean - northwestern, Japan - Hokkaido
Topics: Radiolaria, Ocean cores, Climate history - Pacific margin, Vegetation history - Japan, Pollen analysis - Pacific margin, Pollen analysis - modern pollen spectra, Pollen analysis - multivariate statistics, Climate reconstruction, Sea surface temperature

1990 Climatic Change at the End of the Last Glaciation in Japan Inferred from Pollen in Three Cores from the Northwest Pacific Ocean. Quaternary Research 34:101-110.

Late-glacial pollen time-series from high-sedimentation-rate marine cores KH79-3-C6, CH84-04, and CH84-14 show the rise of successional vegetation (typified by *Betula*) during the replacement of boreal forest types (*Picea* and *Pinus*) by thermophilous *Quercus* forests. Variations in these three marine pollen records replicate the trends and timing of pollen records from Japan and the structure and timing of vegetation and climatic changes on the Pacific coast of Japan since the last glacial maximum. In marine cores KH79-3-C6, CH84-04, and CH84-14, oxygen isotope and/or marine faunal data have been interpreted as evidence of a cooling event in the northwest Pacific Ocean which is coeval with the Younger Dryas chronozone. Pollen records from these northwest Pacific cores, like those from Japan, do not exhibit a regionally replicated, statistically robust, pollen assemblage which can be unambiguously interpreted as evidence of a late-glacial climatic reversal between ca. 11,000 and 10,000 yr B.P. The apparent disparity between the terrestrial (pollen) and marine

evidence for a climatic oscillation during the Younger Dryas chron in northeast Asia further complicates the variable record of this brief late-glacial event.

Location: AEU SCI QE 696 Q24
Area: Japan, Pacific Ocean - northwestern
Topics: Pollen analysis - multivariate statistics, Dating - analysis of radiocarbon dates, Climate reconstruction, Ocean cores, Pollen analysis - Pacific margin, Vegetation history - Japan, Stable isotopes - $\delta^{18}O$, Climate history - Pacific margin

Hicock, S. R., R. J. Hebda, and J. E. Armstrong
1982 Pollen and Macrofossil Evidence for a Late Wisconsin Glacial Lag in the Pacific Northwest, from Western Fraser Lowland, British Columbia. In *AMQUA, 7th Biennial Meeting, Seattle, Washington, Program and Abstracts*, p. 105.

Location: AEU HSS QE 696 A5212
Area: British Columbia - southwestern
Topics: Climate history - Pacific margin, Glacial history - Pacific margin, Sea level changes, Pollen analysis - Pacific margin

Imbrie, J., A. McIntyre, and T. C. Moore Jr.
1983 The Ocean Around North America at the Last Glacial Maximum. In *Late-Quaternary Environments of the United States Volume 1 The Late Pleistocene*, edited by S. C. Porter, pp. 230-236. University of Minnesota Press, Minneapolis, Minnesota.

Notes: H. E. Wright Jr. (series ed.).
Location: AEU SCI QE 696 L35
Area: Pacific Ocean - northwestern, Pacific Ocean - northeastern
Topics: Climate reconstruction, Sea surface temperature, Glacial history - Pacific margin

Jin Xiaofeng
1985 The Spore-Pollen Assemblages and the Stratigraphy and Palaeogeography in Western Bohai Sea Since Late Pleistocene. Abstracts of Chinese Geological Literature 1(1/2):71. The National Geological Library of the PRC, Beijing, China.

Area: China - eastern
Topics: Sea level changes, Climate history - China, Pollen records - China, Ocean cores

Jousé, A. P.
1967 Diatom Floras and the History of Okhotsk and Bering Seas. In *The Bering Land Bridge*, edited by D. M. Hopkins, pp. 369-372. Stanford University Press, Stanford, California.

Notes: Based on a Symposium held at the VII Congress of the International Association for Quaternary Research (INQUA), Boulder, Colorado, 1965.
Location: AEU SCI QE 39 H79
Area: Bering Sea
Topics: Ocean cores, Sea surface temperature, Diatoms, Sea level changes

Keigwin, L. D., and S. A. Gorbarenko
1992 Sea Level, Surface Salinity of the Japan Sea, and the Younger Dryas Event in the Northwestern Pacific Ocean. Quaternary Research 37:346-360.

The Japan Sea was profoundly different during glacial times than today. Available $\delta^{18}O$ evidence indicates that sea surface salinity was lower by several per mil. This probably increased the stability of the water column and caused anoxic sedimentary conditions in the deep sea, as shown by the absence of benthic microfossils and the presence of laminated sediment. These changes are likely related to the effects of late Quaternary sea-level change on the shallow sills (ca. 130 m) across which the Japan Sea exchanges with the open ocean. The Hwang He (Yellow River) has previously been implicated as the source of fresh water to the Japan Sea during glaciation, but the possible roles of the Amur River and excess precipitation over evaporation must also be considered. Ambiguous radiocarbon chronologies for the latest Quaternary of Japan Sea cores do not adequately constrain the timing of salinity lowering. Previous studies have suggested that lowest sea surface salinity was achieved 27,000 to 20,000 ^{14}C yr B.P. However, if global sea-level fall restricted exchange with the open ocean circulation, then lowest salinity in the Japan Sea may have occurred as recently as 15,000 to 20,000 yr ago when sea level was lowest. If this alternative is correct, then as sea level abruptly rose about 12,000 yr ago, relatively fresh water must have been discharged to the open Pacific. This might have affected the dynamics of outflow, local faunal and floral expression of the polar front, and stable isotope ratios in foraminifera. These environmental changes could be misinterpreted as evidence for the cooling of Younger Dryas age, which has not been identified in nearby terrestrial records.

Location: AEU SCI QE 696 Q24
Area: Japan - Sea of Japan
Topics: Ocean cores, Climate history - Pacific margin, Sea level changes, Sea surface salinity, Stable isotopes - $\delta^{18}O$, Foraminifera, Tephra - Japan, Climate reconstruction

Mann, D. H., and D. M. Peteet
1991 Late Wisconsin Glaciers and Paleoclimate on the Alaska Peninsula and Kodiak Island, U.S.A. In *INQUA, 13th International Congress, Beijing, China, Abstracts*, p. 229.

Area: Alaska - southern, Eastern Beringia
Topics: Glacial history - Pacific margin, Human migration, Refugia, Vegetation history - Pacific margin, Climate history - Pacific margin

Mathewes, R. W.
1979 A Paleoecological Analysis of Quadra Sand at Point Grey, British Columbia, Based on Indicator Pollen. Canadian Journal of Earth Sciences 16:847-858.

Pollen and spore percentages and concentrations were determined from six peaty zones about 24 500 radiocarbon years old at the Point Grey sea cliffs. All samples are dominated by nonarboreal pollen, especially Cyperaceae of local origin and Gramineae. Analysis of 'indicator pollen' suggests that two floristic elements were present, a local wetland component and a montane to subalpine element. This study supports the geological contention that the Quadra Sand was deposited in a braided river environment under a cooler macroclimate than exists at present. Pollen concentrations in the samples are within the range of some bog and lake sediments presently accumulating in the Fraser Lowland area of southwestern British Columbia, suggesting that climatic conditions were not of alpine severity around 24 500 BP, although the indicator pollen assemblage suggests a climatic regime similar to present-day midmontane or subalpine conditions.

Location: AEU SCI QE 1 C212
Area: British Columbia - southwestern
Topics: Pollen analysis - Pacific margin, Vegetation history - Pacific margin, Plant macrofossils - peat, Plant macrofossils - wood, Climate history - Pacific margin

Mathewes, R. W., and J. J. Clague
1982 Stratigraphic Relationships and Paleoecology of a Late-Glacial Peat Bed from the Queen Charlotte Islands, British Columbia. Canadian Journal of Earth Sciences 19:1185-1195.

The stratigraphic relationships of late-glacial and Holocene sediments exposed in sea cliffs at Cape Ball on the Queen Charlotte Islands are summarized, based on section descriptions and 13 radiocarbon dates on wood, peat, and marine pelecypod shells. One peat bed dated at 12 400 ± 100 years BP (GSC-3112) to 10 200 ± 90 BP (GSC-3159) was investigated for pollen and plant macrofossils. This study extends the late Pleistocene vegetation history of the Queen Charlotte Islands by about 1550 years, and suggests that the record will date back to before 13 700 ± 100 BP (GSC-3222).

Four local pollen zones are described from the 70 cm thick peat, beginning with a 7 cm thick herb-dominated zone (CB-1), characterized by up to 60% grass pollen, and including a unique assemblage with abundant Apiaceae, Cyperaceae, *Empetrum*/Ericaceae, *Polemonium*, *Plantago macrocarpa*, *Fritillaria*, and *Ranunculus*. A high diversity of other herbs, including subalpine/alpine species and two taxa presently absent from the Charlottes (*Armeria maritima* and *Polemonium caeruleum* type), suggests that this zone represents an open floodplain vegetation with no modern analogue. Zone CB-2 (63-45 cm) is dominated by *Pinus contorta* type pollen (65-70%) and moderate values for fern spores. Zone CB-3 (45-30 cm) shows a rapid rise of *Picea* pollen from 3 to 39%, followed by a drop to about 12%. Fern spores (20-50%) and *Alnus* (6%) also reach maximum levels in this zone. Abundant wood fragments and sand inclusions are compatible with an interpretation of a swampy floodplain forest during this interval. The uppermost zone (30-0 cm) exhibits high *Pinus contorta* (40-60%) and Cyperaceae (12-38%) values, along with a moderate abundance of grasses, ferns, and Apiaceae. Estuarine and marine sediments with pelecypod shells, deposited during a marine transgression, overlie the peat bed.

Implications for the controversy over the existence of late Pleistocene refugia in the Charlottes are briefly discussed.

Location: AEU SCI QE 1 C212
Area: British Columbia - Queen Charlotte Islands
Topics: Palynological sites - Cape Ball, Stratigraphy, Vegetation history - *Polemonium caeruleum*, Plant macrofossils - peat, Pollen analysis, Plant macrofossils - wood, Vegetation history, Refugia, Dating - analysis of radiocarbon dates, Plant macrofossils - seeds, Molluscs - marine

Mathewes, R. W., B. G. Warner, and J. J. Clague
1982 Ice-Free Conditions on the Queen Charlotte Islands at the Height of Fraser Glaciation: Geological, Radiocarbon, and Plant Macrofossil Evidence. In *AMQUA, 7th Biennial Meeting, Seattle, Washington, Program and Abstracts*, p. 132.

Location: AEU HSS QE 696 A5212
Area: British Columbia - Queen Charlotte Islands
Topics: Stratigraphy, Plant macrofossils - seeds, Refugia

Mathews, W. H.
1979 Late Quaternary Environmental History Affecting Human Habitation of the Pacific Northwest. Canadian Journal of Archaeology No. 3:145-156.

This paper reviews the record of late Quarternary [sic] environmental conditions and suggests how these could have affected habitation by early man in the Pacific Northwest. Emphasis is given to conditions since about 30,000 B.P. so as to include the possibility of human habitation before the last climax of glaciation, 15,000 years ago. The environments in the coastal area of British Columbia and Washington have been stressed as this is where most data have so far been collected, but in recognition of speculations concerning passage of early man through the interior of British Columbia some thoughts have been offered for this area as well. Whether man did, in fact appear on the scene to face these conditions during or before the last glaciation is as yet unresolved, but the problems he might have faced had he done so still merit consideration.

Location: AEU PMC FC 65 C1152
Area: British Columbia - southwestern, Washington - northwestern
Topics: Faunal remains - Pacific margin, Review of glacial history - British Columbia - southern, Climate history - Pacific margin, Sea level changes, Pollen records - Pacific margin, Review of vegetation history - British Columbia - southern, Human migration

Miller, R. F., A. V. Morgan, and S. R. Hicock

1982 A Pre-Vashon Insect Assemblage from the Fraser Lowland, British Columbia. In *AMQUA, 7th Biennial Meeting, Seattle, Washington, Program and Abstracts*, p. 141.

Location: AEU HSS QE 696 A5212
Area: British Columbia - southwestern
Topics: Insect macrofossils - beetles, Glacial history, Stratigraphy

Moore Jr., T. C.

1973 Late Pleistocene-Holocene Oceanographic Changes in the Northeastern Pacific. Quaternary Research 3:99-109.

The distributions of the radiolarian assemblages in the Northeastern Pacific Ocean were determined and correlated with the average summer temperature of the near surface waters of this region. These assemblages were compared with those in three sediment cores taken beneath the Transition Zone waters. This comparison indicates that the assemblage off Oregon at the last maximum cold interval (24,000 yr B.P.) was like that now found off southern Alaska. The correlation of the radiolarian assemblages with temperature gives an estimate of 11°C for the average summer temperature at that time. This is approximately 4°C cooler than present day conditions in the area. Superimposed on the general warming trend that began 24,000 y.a., there are minor oscillations in the assemblages which correspond to estimates of temperature change of about 2°C in the Pleistocene and about 1°C in the Holocene. In the Holocene, these minor warm intervals appear to be approximately synchronous with advances in mountain glaciers.

Location: AEU SCI QE 696 Q24
Area: Pacific Ocean - northeastern
Topics: Radiolaria, Foraminifera, Multivariate statistics, Sea surface temperature, Climate reconstruction, Ocean cores, Climate history - Pacific margin

Morley, J. J., and L. E. Heusser

1989 Late Quaternary Atmospheric and Oceanographic Variations in the Western Pacific Inferred from Pollen and Radiolarian Analyses. Quaternary Science Reviews 8:263-276.

Pollen and radiolarian analyses of sediment from four piston cores located along a south-north transect (28-44°N) off the east coast of Japan yield detailed records of variations in terrestrial and marine climate of this region for the last 140 ka. The last interglacial climate of the southern half of Japan was characterized by increased temperature and precipitation (at least across central Japan) compared with today. Off southern Japan, surface waters were cooler during summer than at present; off central central Japan, both summer and winter sea-surface temperatures were cooler than today. Early glacial (115-71 ka BP) climate across central and southern Japan alternated between wet and dry warm temperate, with surface waters offshore warmer in summer and winter than during the penultimate interglacial. Temperatures and precipitation in Japan reached low levels early during the full glacial phase and remained relatively low throughout much of the full glacial (71-17 ka BP). Cold sea-surface temperatures at all our sites coincided with these cold conditions on land. Temperatures across much of Japan began to increase steadily during the deglacial, with surface waters offshore remaining at or near their glacial lows. Holocene vegetation patterns, which continued to reflect an increase in temperature, reached a maximum during early to mid Holocene. Surface waters offshore, however, remained relatively cool during the early Holocene with temperature maxima at most western Pacific sites occurring in mid to late Holocene.

We propose specific changes in the seasonal positions of atmospheric pressure cells to explain these climate variations that have occurred across the northeast Asian/northwest Pacific region through the most recent interglacial/glacial cycle. Results of this exercise show that there are no major discrepancies between climate reconstructions for mainland Japan inferred from pollen and those for the western Pacific derived from radiolarians.

Location: AEU SCI QE 696 Q245
Area: Pacific Ocean - northwestern
Topics: Ocean cores, Pollen analysis - Pacific margin, Radiolaria, Vegetation history - Pacific margin, Climate history - Pacific margin, Sea surface temperature, Pollen analysis - multivariate statistics, Climate reconstruction, Palaeomagnetism, Stable isotopes - $\delta^{18}O$

Petersen, K. L., P. J. Mehringer Jr., and C. E. Gustafson

1983 Late-Glacial Vegetation and Climate at the Manis Mastodon Site, Olympic Peninsula, Washington. Quaternary Research 20:215-231.

As the late Wisconsin Cordilleran Ice Sheet retreated, sediment accumulated in shallow depressions at the Manis Mastodon Archaeological site on the Olympic Peninsula, near Sequim, Washington. Pollen, plant macrofossils, and bones of mastodon, caribou, and bison occur within the lower 47 cm of these deposits. The fossil pollen and seed assemblages indicate persistence for 1000 yr (11,000-12,000 yr B.P.) of an herb-and-shrub-dominated landscape at a time when forest species appear elsewhere in Washington and in adjacent British Columbia.

At present, Sequim is near the northern coastal limits of both Cactaceae and *Ceratophyllum*. Mean annual precipitation is 42.7 cm and summer temperatures average 15°-16°C in July. The absence of coniferous trees and the presence of cactus and *Ceratophyllum* in late-glacial sediments are explained by a regional climate that was drier and at least as warm as today. These conditions persisted in the rain shadow of the Olympic Mountains until at least 11,000 yr B.P.

Location: AEU SCI QE 696 Q24
Area: Washington - northwestern
Topics: Archaeological sites - Manis, Faunal remains - *Mammut americanum*, Faunal remains - *Bison*, Faunal remains - *Rangifer*, Plant macrofossils - *Salix* twigs, Plant macrofossils - *Ceratophyllum* seeds, Plant macrofossils - seeds, Pollen analysis, Climate history, Vegetation history

Saidova, H. M.

1967 Depth Changes in Bering Sea During the Upper Quaternary, as Indicated by Benthonic Foraminifera. In *The Bering Land Bridge*, edited by D. M. Hopkins, pp. 364-368. Stanford University Press, Stanford, California.

Notes: Based on a Symposium held at the VII Congress of the International Association for Quaternary Research (INQUA), Boulder, Colorado, 1965.
Location: AEU SCI QE 39 H79
Area: Bering Sea
Topics: Ocean cores, Sea level changes, Foraminifera

Sancetta, C., and S. W. Robinson

1983 Diatom Evidence on Wisconsin and Holocene Events in the Bering Sea. Quaternary Research 20:232-245.

Previous work on surface (modern) sediments has defined diatom species which appear to be good indicators of various oceanographic/ecologic conditions in the North Pacific Ocean and marginal seas. Three long cores from the eastern and northern sides of the Aleutian Basin show changes in species assemblage which can be interpreted in terms of changes in the ocean environment during the last glaciation (Wisconsin) and the Holocene. The early and late Wisconsin maxima were times of prolonged annual sea-ice cover and a short cool period of phytoplankton productivity during the ice-free season. The middle Wisconsin interstade, at least in the southern Bering Sea, had greater seasonal contrast than today, with some winter sea-ice cover, an intensified temperature minimum, and high spring productivity. Variations in clastic and reworked fossil material imply varying degrees of transport to the basin by Alaskan rivers. The results of Jousé from the central Bering Sea generally correspond with those presented here, although there are problems with direct comparison.

Location: AEU SCI QE 696 Q24
Area: Bering Sea
Topics: Dating - analysis of radiocarbon dates, Stable isotopes - $\delta^{13}C$, Sea surface temperature, Sea surface salinity, Ocean cores, Diatoms, Sea level changes

Smith, P. B.

1965 Possible Pleistocene-Recent Boundary in the Gulf of Alaska, Based on Benthonic Foraminifera. In *Studies on the Quaternary, 1963-1965*, pp. 53-57. U.S. Geological Survey.

Of 10 cores from sediments in the Gulf of Alaska, 7 contained boreal faunas throughout, similar to those living in the area today, and 3 contained boreal foraminiferal faunas at the top and Arctic faunas in the lower part. It is inferred from the cores that the change in faunas marks a possible Pleistocene-Recent boundary in the sediments.

Notes: Reprinted from U. S. Geological Survey Professional Paper 475-C, pp. C73-C77, 1963. Compilation distributed at the VII INQUA Congress, Boulder and Denver, 1965.
Location: AEU SCI QE 696 U58
Area: Eastern Beringia, Alaska - southern
Topics: Foraminifera, Ocean cores, Plant macrofossils - wood

Terasmae, J., and J. G. Fyles

1959 Palaeobotanical Study of Late-Glacial Deposits from Vancouver Island, British Columbia. Canadian Journal of Botany 37:815-817.

Plant-bearing beds have been discovered by J. G. Fyles in late-glacial deposits from the Englishman River section, Vancouver Island, B.C. Radiocarbon dating indicated an age of ca. 12,000 years for these beds. Fossil cones of *Pinus contorta* Dougl. and leaves of *Dryas drummondii* Richards. were discovered and identified. Palynological study indicates that climate at the time was colder than the present.

Notes: Paper contains plates of intact plant macrofossils.
Location: AEU SCI QK 1 C21
Area: British Columbia - southwestern
Topics: Stratigraphy, Plant macrofossils - *Pinus* cones, Plant macrofossils - *Dryas*, Vegetation history - Pacific margin, Pollen analysis - Pacific margin, Sea level changes, Molluscs - marine, Climate history - Pacific margin

Wang Kaifa et al.

1984 Spores, Pollen and Algal Assemblages of the Late Pleistocene from the Sea Area of East China and Paleogeographic Environment Changes. In *6th International Palynological Conference, Calgary, Abstracts*, p. 181.

Area: China - East China Sea, China - Yellow Sea, China - Bohai Sea
Topics: Pollen analysis - Pacific margin, Sea level changes, Climate history - Pacific margin

Wang Kai Fa, Zhang Yu Lan, Jiang Hui, and Sun Yu Hua

1980 Research on the Spore-Pollen and Algal Assemblages in Bottom Sediments from the East China Sea. In *5th International Palynological Conference, Cambridge, England, Abstracts*, p. 423.

Area: China - East China Sea
Topics: Ocean cores, Climate history - Pacific margin, Pollen analysis - Pacific margin, Diatoms, Sea level changes

Warner, B. G., and J. G. Chmielewski

1987 Biometric Analysis of Modern and Late Pleistocene Cones of *Picea* from Western Canada. The New Phytologist 107:449-457.

Late Pleistocene and early Holocene fossil *Picea* cones and modern cones of *Picea sitchensis* (Bong.) Carr. from Cape Ball, Queen Charlotte Islands, British Columbia were compared for morphological variability. Modern cones of *P. sitchensis* from Cape Ball are most similar to populations in the area of Prince Rupert, British Columbia. The fossil

cones resemble most closely modern *P. glauca* (Moench) Boss. and allopatric *P. sitchensis* x *P. glauca* in cone size, scale size and phyllotaxy, which suggests introgression between *P. sitchensis* and *P. glauca* in late Pleistocene time on the north coast of British Columbia. These results suggest that *P. glauca* and *P. sitchensis* migrated northward shortly after deglaciation along the coast and that *P. sitchensis* maintained *P. glauca* cone characteristics before assuming more or less independent distributional ranges along the coast of British Columbia.

Location: AEU SCI QK 1 N53
Area: British Columbia - Queen Charlotte Islands
Topics: Plant macrofossils - *Picea* cones, Vegetation history - *Picea*, Glacial history - Pacific margin, Vegetation history - Pacific margin, Pollen analysis - Pacific margin, Plant macrofossils - peat, Refugia

Warner, B. G., J. J. Clague, and R. W. Mathewes
1984 Geology and Paleoecology of a Mid-Wisconsin Peat from the Queen Charlotte Islands, British Columbia, Canada. Quaternary Research 21:337-350.

A peat bed on east-central Graham Island of the Queen Charlotte Islands occurs within a nonglacial fluvial succession that is both overlain and underlain by glacial deposits. Radiocarbon dates of 27,500 ± 400 and 45,700 ± 970 yr B.P. at the top and base of the peat, respectively, indicate that it was deposited during the mid-Wisconsin nonglacial interval. The peat is the first documented mid-Wisconsin organic deposit in northern coastal areas of British Columbia. Three local pollen zones are represented. The lowest zone (PM-1) is restricted to sandy silt directly underlying the dated peat. Very high Cyperaceae and moderate Poaceae pollen percentages characterize zone PM-1, and a variety of other herbs are common, suggesting an open landscape rather than a forested one. The middle zone (PM-2) is characterized by abundant pollen of *Picea*, *Tsuga mertensiana*, and Cyperaceae, and also contains pollen of *Abies*, a genus now absent from the Queen Charlotte Islands. Graham Island probably had extensive forests at this time, but abundant pollen and macrofossils of Cyperaceae and emergent aquatics such as *Hippuris vulgaris*, *Veronica scutellata*, *Potentilla palustris*, and *Menyanthes trifoliata* indicate that there also were open wetland areas. Zone PM-3 also contains abundant arboreal pollen. Large amounts of *Sphagnum* spores and *Selaginella selaginoides* megaspores indicate succession of the wetland area at the sample site to a peat bog. Paleoecological analysis of the data suggests that subalpine vegetation elements were depressed by at least 400 m, probably due to a cooler climate. Probable modern analogs in southeastern Alaska and the presence of *Abies* (probably *A. amabilis*) indicate that precipitation was higher on eastern Graham Island during the mid-Wisconsin than at the present.

Location: AEU SCI QE 696 Q24
Area: British Columbia - Queen Charlotte Islands
Topics: Glacial history - Pacific margin, Stratigraphy, Pollen analysis - Pacific margin, Vegetation history - Pacific margin, Climate history - Pacific margin, Sea level changes, Plant macrofossils - peat, Plant macrofossils - seeds, Plant macrofossils - *Salix* bud scales, Plant macrofossils - *Tsuga* needles, Insect macrofossils

Warner, B. G., R. W. Mathewes, and J. J. Clague
1982 Ice-Free Conditions on the Queen Charlotte Islands, British Columbia, at the Height of Late Wisconsin Glaciation. Science 218:675-677.

New radiocarbon dates and plant macrofossil data establish that parts of the Queen Charlotte Islands, British Columbia, were ice-free during and subsequent to the late Wisconsin glacial maximum on the Pacific coast of Canada. A paleoecological investigation of dated sediments at Cape Ball has indicated that a varied flora consisting of terrestrial and aquatic plants was present there about 16,000 years ago. This finding provides support for the existence of a heretofore questioned biotic refugium on the Queen Charlotte Islands during the last glaciation. These results shed new light on problems of glacial chronology, climatic change, biogeography, and archeology along the western margin of North America.

Location: AEU SCI Q 1 S41
Area: British Columbia - Queen Charlotte Islands

Topics: Refugia, Plant macrofossils - peat, Plant macrofossils - seeds, Dating - analysis of radiocarbon dates, Glacial history - Pacific margin, Sea level changes

PART 3. LATE QUATERNARY PALAEONTOLOGY

Dixon, E. J.

1983 Pleistocene Proboscidean Fossils from the Alaskan Continental Shelf. Quaternary Research 20:113–119.

Pleistocene proboscidean fossils recovered from the Bering Land Bridge strengthen the hypothesis that man may have originally colonized the Americas via this route during times of lowered sea level.

Location: AEU SCI QE 696 Q24
Area: Chukchi Sea, Kotzebue Sound, Bristol Bay, Beringia
Topics: Faunal remains - *Mammuthus*, Beringian environment, Taphonomy

Durham, J. W., and F. S. MacNeil

1967 Cenozoic Migrations of Marine Invertebrates Through the Bering Strait Region. In *The Bering Land Bridge*, edited by D. M. Hopkins, pp. 326-349. Stanford University Press, Stanford, California.

Marine molluscan genera that have simple biogeographic histories and that originated and developed in the middle and higher latitudes of the North Pacific and North Atlantic Oceans are most significant in evaluating marine migrations through Bering Strait and the Arctic Ocean. The available evidence suggests that no transarctic Cenozoic marine migrations occurred earlier than about late Miocene (Pontian) time; during late Pliocene and Pleistocene time, migrations are well documented. These data do not require the connecting seaways to have remained open continuously after their first establishment. It seems more probable that the seaways were intermittently open and closed, but the molluscan paleontological data on hand do not permit accurate dating of these fluctuations.

Notes: Based on a Symposium held at the VII Congress of the International Association for Quaternary Research (INQUA), Boulder, Colorado, 1965. Conclusion used as abstract.
Location: AEU SCI QE 39 H79
Area: Bering Sea, Pacific Ocean - northern
Topics: Zoogeography - echinoderms, Faunal migration, Palaeontology, Sea level changes, Beringian land bridge connection, Zoogeography - molluscs, Molluscs - marine

Harington, C. R.

1975 Pleistocene Muskoxen (*Symbos*) from Alberta and British Columbia. Canadian Journal of Earth Sciences 12:903-919.

Skull fragments of the extinct muskox *Symbos cavifrons* from late Pleistocene gravels at Fort Saskatchewan and Saanich Peninsula, Vancouver Island are the first records of that species for Alberta and southern British Columbia respectively. The Alberta specimen shows that *Symbos* herds once grazed along the eastern flanks of the Rocky Mountains.

The discovery of a muskox fossil (and remains of other ice age land mammals) on southeastern Vancouver Island suggests that land connected the island with the mainland during the late Pleistocene. Causes for such a land connection or connections are considered.

Location: AEU SCI QE 1 C212
Area: British Columbia - southwestern
Topics: Faunal remains - *Symbos cavifrons*, Palaeontological sites - British Columbia, Palaeontological sites - Eastern Beringia, Zoogeography - *Symbos*, Faunal migration, Sea level changes, Faunal remains - *Mammut americanum*, Faunal remains - *Mammuthus imperator*, Faunal remains - *Mammuthus columbi*, Faunal remains - *Equus*, Faunal remains - *Bison*, Faunal remains - *Cervus elaphus*

Harington, C. R., and G. Beard

1992 The Qualicum Walrus: A Late Pleistocene Walrus (*Odobenus rosmarus*) Skeleton from Vancouver Island, British Columbia, Canada. Annales Zoologici Fennici 28:311-319.

An adult female walrus skeleton from Early Wisconsin glaciomarine clay near Qualicum Beach, Vancouver Island is the best preserved Pleistocene walrus specimen recorded from the west coast of North America. Paleoenvironmental, stratigraphic and geochronological data on the Qualicum walrus are in accord with known habits and habitat of modern walruses, as well as with knowledge of the species' past distribution - suggesting southerly advances during Pleistocene glaciations and northward withdrawals during interglacials.

Location: AEU SCI QL 1 A53
Area: British Columbia - southwestern
Topics: Faunal remains - *Odobenus rosmarus*, Zoogeography - *Odobenus*, Stratigraphy, Diatoms, Molluscs, Palaeontological sites - British Columbia

PART 4. ARCHAEOLOGY AND HUMAN HISTORY

Ackerman, R. E.

1988 Settlements and Sea Mammal Hunting in the Bering-Chukchi Sea Region. Arctic Anthropology 25(1):52-79.

A discussion of the relationships between the physical and biological parameters of the Bering-Chukchi Sea region is presented to provide some insights into the adaptive strategies of sea mammal hunting. The acquisition of ecological information critical to sea mammal hunting was attained via a series of cultural adaptations over several millennia. The dynamics behind these cultural adaptations are the movement of hunting/gathering societies into the New World and the flooding of the Bering-Chukchi Sea marine platform. These relations are explored from c. 22,000 B.P. to the late prehistoric period. Prehistoric evidence for the hunting of land mammals precedes that of sea mammal hunting by several millennia. The earliest indication of sea mammal hunting occurs c. 9500 B.P. in southeastern Alaska and is followed shortly by evidence in the Aleutian-Alaska Peninsula region (8500 B.P.). Here ice-free conditions permitted the open sea type of sea mammal hunting. The northern pattern of sea ice hunting emerged considerably later, beginning in the Denbigh complex of the Arctic Small Tool tradition. The Old Whaling culture (3300 B.P.) appears as an early but aberrant whale hunting society to be followed by multiresource based groups such as Choris and Norton which utilized land resources as much as those of the sea. Whale hunting, as a full blown cultural complex, is evident for the first time in the Bering Strait region with the initiation of the Neoeskimo stage (c. 2000 B.P.: Okvik-Old Bering Sea phases) when the motivation may have been as much social as ecological.

Location: AEU PMC GN 1 A68
Area: Kamchatka, Bering-Chukchi platform
Topics: Sea level changes, Human migration, Cultural traditions, Cultural traditions - Diuktai, Archaeological sites - Eastern Beringia, Archaeological sites - Anangula, Archaeological sites - Dry Creek, Archaeological sites - Bluefish Caves, Palaeontological sites - Old Crow, Archaeological sites - Western Beringia, Archaeological sites - Lake Ushki, Climate history, Vegetation history, Glacial history, Beringian ecology, Modern biogeography

Ackerman, R. E., T. D. Hamilton, and R. Stuckenrath

1979 Early Culture Complexes on the Northern Northwest Coast. Canadian Journal of Archaeology No. 3:195-209.

The occupation of the northern sector of the Northwest Coast during the Early Period (circa 10,000-5,000 BP) is represented by a scattering of sites on the mainland and the off shore islands of the Alexander Archipelago. Definition of the cultural phase (s) [sic] is thus far limited to lithic inventories. Information, thus far available, indicates a considerable amount of contact among groups on the coast and continuing relations with interior groups on the mainland. Characterization of the coastal adaptations during this time period will be based mainly on data from archaeological and geological investigations, and from radiocarbon dating of sites in the Icy Strait-Lynn Canal region.

Location: AEU PMC FC 65 C1152
Area: British Columbia - Queen Charlotte Islands, Alaska - southeastern
Topics: Human migration, Lithics, Pollen records - Pacific margin, Geoarchaeology, Vegetation history - Pacific margin, Glacial history - Pacific margin, Cultural traditions, Climate history - Pacific margin, Archaeological sites - British Columbia - western

Borden, C. E.

1979 Peopling and Early Cultures of the Pacific Northwest. Science 203:963-971.

In past discussions and speculations concerning the early peopling of the New World, the hypothesized "migration corridor" between the Cordilleran and Laurentian ice sheets has figured prominently. By contrast with this much-mooted route east of the Rocky Mountains, little consideration has been given to possible routes west of the Rockies. I will examine such alternatives and attempt to document several early population movements with reference to available cultural and chronometric data. The once glaciated areas of the Pacific Northwest represent an ideal natural laboratory for tracing

population expansions during early postglacial time. We start with a clean slate as it were. Recent findings in British Columbia will be of special importance.

Location: AEU SCI Q 1 S41
Area: British Columbia - western, British Columbia - Queen Charlotte Islands, Eastern Beringia
Topics: Human migration, Glacial history, Lithics, Cultural traditions, Archaeological sites - British Columbia, Archaeological sites - Healy Lake, Archaeological sites - Groundhog Bay, Plant macrofossils, Lithic affinities

Byers, D. S.

1957 The Bering Bridge - Some Speculations. Ethnos 22:20-26.

Location: AEU PMC GN 1 E845
Area: Beringia
Topics: Sea level changes, Human migration

Fladmark, K. R.

1978 The Feasibility of the Northwest Coast as a Migration Route for Early Man. In *Early Man in America from a Circum-Pacific Perspective*, edited by A. L. Bryan, pp. 119-128. Occasional Papers No 1 of the Department of Anthropology, University of Alberta. Archaeological Researches International, Edmonton, Alberta.

Location: AEU HSS GN 17 E12
Area: British Columbia - western, British Columbia - Queen Charlotte Islands
Topics: Human migration, Refugia, Glacial history - Pacific margin, Sea level changes, Pollen records - Pacific margin, Molluscs, Zoogeography - *Rangifer dawsoni*

1990 Possible Early Human Occupation of the Queen Charlotte Islands, British Columbia. Canadian Journal of Archaeology 14:183-197.

This paper describes a small assemblage of flaked stone tools which were found *in situ* throughout a deep section of raised beach deposits near the northern end of the Queen Charlotte Islands. Those littoral sediments were left by a high relative sea level position which existed around the Charlottes between about 9,000 and 4,500 years ago. The occurrence of artifacts throughout the thickness of those raised beach deposits implies that they were washed out of an existing coastal site as the sea level rose to its maximum position, or represent "palaeointertidal" occupations which had occurred during the same period. In either case, this suggests the presence of a human population on those outer islands certainly predating the oldest radiocarbon dated occupations at about 8000 B.P. This tends to support previous suggestions that the Charlottes might have been an important link in a chain of sea level refugia along the Pacific coast, used by early populations spreading south from Beringia.

Location: AEU PMC FC 65 C1152
Area: British Columbia - Queen Charlotte Islands
Topics: Human migration, Plant macrofossils, Refugia, Sea level changes, Zoogeography - *Rangifer dawsoni*, Vegetation history - Pacific margin, Lithics, Archaeological sites - Groundhog Bay, Archaeological sites - Queen Charlotte Islands, Geoarchaeology, Palaeosols

Goldthwait, R. P.

1978 Glacier Bay Refugium - Continual Access to Early Man. In *AMQUA, 5th Biennial Meeting, Edmonton, Alberta, Abstracts*, pp. 204-205.

Location: AEU HSS QE 696 A5212
Area: Alaska - southeastern, Eastern Beringia
Topics: Refugia, Human migration, Glacial history, Sea level changes

Gruhn, R.

1991 The Coastal Entry Model of the Initial Settlement of the New World. In *INQUA, 13th International Congress, Beijing, China, Abstracts*, p. 121.

Area: Canada - western, Eastern Beringia
Topics: Human migration, Cultural traditions

Gustafson, C. E., D. Gilbow, and R. D. Daugherty

1979 The Manis Mastodon Site: Early Man on the Olympic Peninsula. Canadian Journal of Archaeology No. 3:157-164.

The Manis site on the northern Olympic Peninsula near Sequim, Washington, has yielded evidence that a mastodon was butchered there approximately 12,000 years ago. A bone "projectile point" embedded in a mastodon rib and other artifacts made of bone and tusk have been recovered. A single cobble spall tool is the only distinguishable stone artifact associated with the mastodon bones. By 12,000 years ago, coniferous forests had not yet invaded the northern Olympic Peninsula, and shrub-tundra vegetation characterized the region. Evidence of later occupation at the site is provided by a leaf-shaped, basalt "Olcott" point found directly above a layer of volcanic ash derived from Mt. Mazama.

Location: AEU PMC FC 65 C1152
Area: Washington - northwestern
Topics: Archaeological sites - Manis, Bone modification, Lithics, Faunal remains - *Mammut americanum*, Faunal remains - *Bison*, Faunal remains - *Ondatra zibethicus*, Plant macrofossils, Pollen records, Vegetation history, Geoarchaeology, Tephra

Laughlin, W. S.

1967 Human Migration and Permanent Occupation in the Bering Sea Area. In *The Bering Land Bridge*, edited by D. M. Hopkins, pp. 409-450. Stanford University Press, Stanford, California.

The Bering Land Bridge provided two distinct kinds of routes for migration into North America - coastal and interior. It also provided permanent residence, especially for inhabitants of the southern coast. Conditions in the interior were severe, and likely only a few of its inhabitants found their way into North America; these wanderers probably became the ancestors of the American Indians. Coastal conditions were ecologically much more congenial to human occupation; coastal settlers became the ancestors of the Aleuts and the Eskimos. All migrations into the New World moved across either the coastal or the interior portions of the land bridge, or both; none entered by way of the Commander and Aleutian Islands. ...

This hypothesis that the ancestors of the Aleuts and the Eskimos actually lived on the coast of the Bering Land Bridge and that the ancestral Eskimos were forced to withdraw as the water levels rose while the Aleuts remained in place is supported by a diverse body of evidence, including the early lithic remains, the biological differences between Aleuts and Eskimos, the linguistic distinctiveness, the ecological base, and the evidences of continuity in one area. Nevertheless, this is a hypothesis that needs considerably more evidence, such as actual skeletons of older inhabitants and earlier sites closer to or on the old coastlines, and it needs to be examined and tested in company with alternative hypotheses.

Notes: Based on a Symposium held at the VII Congress of the International Association for Quaternary Research (INQUA), Boulder, Colorado, 1965. Abstract taken from summary.
Location: AEU SCI QE 39 H79
Area: Western Beringia, Aleutian Islands, Eastern Beringia
Topics: Human migration, Human genetics, Beringian land bridge connection, Lithics, Linguistics, Faunal remains, Archaeological sites - Chaluka, Archaeological sites - Anangula

Linné, S.

1955 The Bering Isthmus - Bridge between Asia and America. Ethnos 20:210-215.

Location: AEU PMC GN 1 E845
Area: Beringia

Topics: Human migration, Sea level changes

Meltzer, D. J., and R. C. Dunnell

1987 Fluted Points from the Pacific Northwest. Current Research in the Pleistocene 4:64-67.

Location: AEA PMA/ASA
Area: Washington - northwestern, Eastern Beringia
Topics: Lithics, Lithic affinities, Geoarchaeology, Archaeological sites, Plant macrofossils - peat

Vasil'evskii, R. S.

1986 The Role of Beringia in the Colonization of the Aleutian Islands. Translated by R. Chakravarty. In *Beringia in the Cenozoic Era*, edited by V. L. Kontrimavichus, pp. 661-668. Russian Translation Series No. 28. A. A. Balkema, Rotterdam, The Netherlands.

One of the important and interesting issues on the ancient history of the North Pacific is the settlement of the Aleutians. So far there is no unanimity on the subject. Some think that the settlement of the islands proceeded from the west, i.e. from Asia via Kamchatka and the Commander Islands (Iokhel'son); others assume that it took place through Alaska (Quimby, Spolding et al.). The Anangula site with radiocarbon datings ranging from 7660 ± 30 to 8425 ± 275 BP presents exceptional interest for the solution of this problem. The Anangula stone inventory differs sharply from everything previously known in North America. Anangulan microblades, for instance, have an utterly different appearance from tools of the microlithic Denby complex. They also differ from the stone artifacts of the so-called Arctic small-tool tradition. On the whole, the Anangula complex resembles not the American tradition, but the Asiatic one, and the clearest analogies have been established precisely in this direction. They are traced back to layers V-VI of the Ushakovskaya site in Kamchatka, the Sakkotsu site in Hokkaido, and the Araya site in Honshu (Japan). The last two sites doubtless have direct conformities with the inventory of the Tadushi site at Primorye (USSR), where blade-industry traditions are especially striking. The analogies of the stone industry of Anangula show that it mostly tends toward the "Pacific" cultural area, where the quest for the starting point of the migration to the north evidently be pursued.

Thus settlement of the Aleutians may have taken place some 10,000 years ago from Asia, and was connected with the spread of Pacific blade-industry traditions. The decisive role in the process belonged to Beringia, whose southern fringes served as the main migration routes to the Aleutians.

Notes: Translation of *Beringiya v Kainozoe*. Vladivostok, 1976. Collection of papers presented at the All-Union Symposium "The Bering Land Bridge and its Role in the History of Holarctic Floras and Faunas in the Late Cenozoic" held at Khabarovsk in May, 1973.
Location: AEU POLAR 56:(*3) KON
Area: Aleutian Islands, Japan - Hokkaido, Siberia - eastern, Western Beringia, Kamchatka
Topics: Archaeological sites - Anangula, Archaeological sites - Lake Ushki, Archaeological sites - Japan - Hokkaido, Archaeological sites - Siberia, Lithics, Lithic affinities, Cultural traditions, Human migration

PART 5. MODERN BIOGEOGRAPHY

Davison, P. G., and D. K. Smith

1992 *Calycularia crispula* (Hepaticae) in the Aleutian Islands and Pacific Northwest of North America. The Bryologist 95(3):266-269.

The range of *Calycularia crispula* Mitt. is extended into the Pacific Northwest of North America (British Columbia, SE Alaska, and the Aleutian Islands). Pacific Northwest material is described and illustrated, and differentiated from other regional thalloid genera. Notes are provided on its habitat and species associates.

Location: AEU SCI QK 534 B91
Area: Aleutian Islands, British Columbia - western, Alaska - southeastern
Topics: Modern biogeography, Biogeography - bryophytes, Plant migration

Gressitt, J. L. (general editor)

1963 *Pacific Basin Biogeography: A Symposium*. Bishop Museum Press, Honalulu, Hawaii. 463 pp.

Notes: Symposium held at the Tenth Pacific Science Congress of the Pacific Science Association, University of Hawaii, Honalulu, Hawaii, August 21 to September 6, 1961, and sponsored by the National Academy of Sciences, Bernice Pauahi Bishop Museum, and the University of Hawaii. C. H. Lindroth, F. R. Fosberg, C. A. Fleming, and E. G. Turbott, section editors.
Location: AEU SCI QK 471 P112
Area: Beringia
Topics: Modern biogeography, Biogeography - Beringia, Plant migration, Zoogeography, Faunal migration, Zoogeography - insects, Beringian land bridge connection

Scheffer, V. B.

1967 Marine Mammals and the History of Bering Strait. In *The Bering Land Bridge*, edited by D. M. Hopkins, pp. 350-363. Stanford University Press, Stanford, California.

... The Pleistocene series of land-and-ice barriers was effective in shaping the evolution of subspecies of beluga, ringed seal, bearded seal, walrus, harbour seal and (?) grey whale. It may have split the common ancestor of the ribbon seal and harp seal, now subgenerically or generically distinct.

Racial differences could conceivably have arisen temporarily between North Pacific and North Atlantic stocks of the narwhal, killer whale, harbor porpoise, finback whale, and little piked whale while trans-Arctic communication was closed during the last glaciation. The time available for the evolution of differences was many tens of thousands of years. The stocks are now able to communicate more or less freely, however, and are not visibly different. We may assume that, if they deviated during the Wisconsin, they did not deviate far. (The narwhal is a special case; it presumably was not forced by ice into both Pacific and Atlantic Subarctic basins but only into the Atlantic.)

Subarctic hooded seals and gray seals are known in the North Atlantic only; no evidence exists that they have crossed the Arctic.

Known in northern temperate waters of the Pacific are six genera, represented by the Dall porpoise, Baird beaked whale, Stellar sea cow, Stellar sea lion, northern fur seal, and sea otter. All are unknown in the North Atlantic. Conversely, the North Atlantic bottle-nosed whale is unknown in the North Pacific. Evidence is lacking that any have crossed the Arctic during late Cenozoic time.

The inferences to be drawn ... is that cold water, not always coincident with ice, has acted as a barrier. It is difficult otherwise to explain the failure of certain cetaceans, sirenians, and seals to cross the Arctic during interglacial periods, at least one of which may have lasted half a million years ...

Notes: Based on a Symposium held at the VII Congress of the International Association for Quaternary Research (INQUA), Boulder, Colorado, 1965.
Location: AEU SCI QE 39 H79
Area: Pacific Ocean - northern
Topics: Faunal remains - marine mammals, Faunal remains - *Hydrodamalis gigas*, Zoogeography - *Enhydra lutris*, Zoogeography - pinnipeds, Zoogeography - cetaceans

SECTION G. MISCELLANEA, INCLUDING BOOK REVIEWS, POPULAR ARTICLES, CONFERENCE REPORTS, AND DISCUSSIONS

Anderson, D. D.

1968 A Stone Age Campsite at the Gateway to America. Scientific American 218(6):24-33.

Location: AEU SCI Q 1 S417
Area: Eastern Beringia, Alaska - western
Topics: Cultural traditions, Lithics, Lithic affinities, Bone modification, Sea level changes, Archaeological sites - Onion Portage, Human migration, Beringian land bridge connection, Stratigraphy

Canby, T. Y.

1979 The Search for the First Americans. National Geographic 156:330-363.

Location: AEU PMC G 1 N277
Area: Alaska, Yukon, Eastern Beringia, Siberia, Western Beringia, China, Japan, Korea, Kamchatka
Topics: Archaeological sites - Western Beringia, Archaeological sites - Afontova Gora, Archaeological sites - Lake Ushki, Archaeological sites - Kokorevo, Archaeological sites - Malta, Archaeological sites - Buryet, Archaeological sites - Diuktai Cave, Archaeological sites - Osinovka, Archaeological sites - Eastern Beringia, Archaeological sites - Zhoukoudian, Archaeological sites - Shiyu, Archaeological sites - Korea, Archaeological sites - Japan, Palaeontological sites - Old Crow, Bone modification, Human migration, Ice-free corridor, Lithics, Lithic affinities, Cultural traditions, Dentition, Beringian environment, Megafauna, Faunal remains

Chang, K. C.

1981 Introducing Far Eastern Archaeology of the 1980s. The Quarterly Review of Archaeology 2(1):5-6.

Notes: Reprinted in The Review of Archaeology 10(1):89-90 (1989) with author's introduction. Review of *Ancient China: Art and Archaeology* by J. Rawson (1980), "Current Issues in Japanese Archaeology" by F. Ikawa-Smith (1980) in American Scientist 68:134-145, and *The Prehistory of Korea* by J. Kim (1978) translated and edited by R. J. Pearson and K. Pearson.
Area: China, Japan, Korea
Topics: Book review, Archaeology

1982 Bibliographic Aids to Chinese Archaeological Research. The Quarterly Review of Archaeology 3(4):1, 11.

Notes: Reviews several Chinese bibliographic publications.
Area: China
Topics: Book review, Archaeology - China, Bibliography

Cinq-Mars, J.

1982 Les Grottes du Poisson-Bleu. Geos 11(1):19-21.

The Bluefish Caves site, located in the Porcupine basin of the northern Yukon interior has yielded a variety of *in situ*, late Pleistocene faunal and archaeological materials indicating that between 17 000 and 12 000 years ago human groups had developed means of adapting themselves to what must have been a fairly severe periglacial climate. This paper describes some of these finds and some of their implications for future research.

Location: AEU SCI TN 1 G35
Area: Yukon - northern, Eastern Beringia
Topics: Archaeological sites - Bluefish Caves, Refugia, Human migration, Beringian environment, Faunal remains - Yukon, Lithics, Bone modification

Language: French

Colinvaux, P. A.

1986 Plain Thinking on Bering Land Bridge Vegetation and Mammoth Populations. The Quarterly Review of Archaeology 7(1):8-9.

Notes: Discussion of "Woolly Arguments Against the Mammoth Steppe - A New Look at the Palynological Data" by R. D. Guthrie (1985) in The Quarterly Review of Archaeology 6(3):9-16, "Quaternary Palynology and Vegetational History of Alaska" by T. A. Ager and L. Brubaker (1985) in *Pollen Records of Late-Quaternary North American Sediments* edited by V. M. Bryant Jr. and R. G. Holloway, and "Late Quaternary Vegetational Changes in the Kotzebue Sound Area, Northwestern Alaska" by P. M. Anderson (1985) in Quaternary Research 24:307-321.
Area: Eastern Beringia, Alaska
Topics: Palynological sites - Squirrel Lake, Palynological sites - Kaiyak Lake, Palynological sites - Hanging Lake, Beringian vegetation, Review of pollen records - Alaska, Vegetation history - Alaska, Discussion

Colinvaux, P. A., and F. H. West

1984 The Beringian Ecosystem. The Quarterly Review of Archaeology 5(3):10-16.

Notes: Review of *Paleoecology of Beringia* edited by D. M. Hopkins, J. V. Matthews Jr., C. E. Schweger and S. B. Young (1982).
Area: Eastern Beringia, Western Beringia
Topics: Beringian vegetation, Beringian ecology, Archaeological sites - Alaska, Review of faunal remains - Alaska, Review of pollen records - Alaska, Beringian land bridge connection, Loess, Periglacial features, Book review, Palynological sites - Cagaloq Lake (formerly Lake Hill Lake), Archaeological sites - Bluefish Caves, Archaeological sites - Healy Lake, Archaeological sites - Dry Creek, Palaeontological sites - Old Crow, Lithics

Dikov, N. N.

1988 On the Road to America. Natural History 97(1):10-14.

Location: AEU SCI QH 1 N28
Area: Siberia - eastern, Western Beringia, Eastern Beringia, Kamchatka
Topics: Archaeological sites, Archaeological sites - Lake Ushki, Archaeological sites - Diuktai Cave, Cultural traditions, Cultural traditions - Diuktai, Archaeological sites - Alaska, Lithics, Lithic affinities, Human migration

Fladmark, K. R.

1986 Getting One's Berings. Natural History 95(11):8-19.

Location: AEU SCI QH 1 N28
Area: Beringia
Topics: Human migration, Sea level changes, Beringian ecology, Glacial history, Ice-free corridor

Gai Pei

1978 From North China to North America - An Evidence Linking Paleolithic Culture in China with North America. China Reconstructs 27(5):46-48.

Location: AEU PMC DS 701 C532
Area: China - northeastern, Eastern Beringia

Topics: Lithics, Human migration, Archaeological sites - Hutouliang, Archaeological sites - Shiyu, Archaeological sites - Alaska, Faunal remains - *Coelodonta antiquitatis*, Faunal remains - *Palaeoloxodon namadicus*, Faunal remains - *Gazella przewalskii*, Faunal remains - *Microtus brandtoides*, Lithic affinities, Cultural traditions

1983 New Research on Chinese Origins of the First Americans. China Reconstructs 32(1):38-40.

Location: AEU PMC DS 701 C532
Area: China - northeastern
Topics: Human migration, Cultural traditions, Archaeological sites, Faunal remains, Lithics, Lithic affinities, Archaeological sites - Hutouliang

Guthrie, R. D.

1981 A Who's Who of Pleistocene Mammals from North America. The Quarterly Review of Archaeology 2(1):20.

Notes: Review of *Pleistocene Mammals of North America* by B. Kurtén and E. Anderson (1980).
Area: North America
Topics: Palaeontology, Faunal remains - Alaska, Book review

1984 The Berelekh Site. The Quarterly Review of Archaeology 5(4):14.

Notes: Review of "Mamontovaya fauna Russkoi ravniny i vostochnoi Sibiri" by O. A. Skarlato (1977) in Proceedings of the Zoological Institute, Leningrad 72:1-110, and *Drevneyshie Etapy Zaseleniya Chelovekom Severo* by Y. A. Mochanov (1977).
Area: Siberia, Western Beringia
Topics: Pollen records - Siberia, Archaeological sites - Berelekh, Cultural traditions - Diuktai, Lithics, Faunal remains, Insect macrofossils - beetles, Book review, Faunal remains - *Mammuthus*, Pollen records

1985 Woolly Arguments Against the Mammoth Steppe - A New Look at the Palynological Data. The Quarterly Review of Archaeology 6(3):9-16.

Notes: Reprinted in The Review of Archaeology 10(1):16-34 (1989) with author's introduction. Discussion of "The Beringian Ecosystem" by P. A. Colinvaux and F. H. West (1984) in The Quarterly Review of Archaeology 5(3):10-16, "Vegetation of the Bering Land Bridge Revisited" by P. A. Colinvaux (1980) in The Quarterly Review of Archaeology 1:2-15, *Past and Present Vegetation of the Far Northwest of Canada* by J. C. Ritchie (1984), "The Late Quaternary Vegetation of the North Yukon" by J. C. Ritchie and L. C. Cwynar (1982) in *The Paleoecology of Beringia* edited by D. M. Hopkins, J. V. Matthews Jr., C. E. Schweger and S. B. Young, and "Arctic Steppe-Tundra: A Yukon Perspective" by L. C. Cwynar and J. C. Ritchie (1980) in Science 208:1375-1377.
Topics: Beringian vegetation, Beringian ecology, Review of pollen records - Alaska, Palaeontological sites - Eastern Beringia, Palaeontological sites - Western Beringia, Review of faunal remains - Alaska, Palynological sites - Squirrel Lake, Palynological sites - Hanging Lake, Palynological sites - Imuruk Lake, Palynological sites - Kaiyak Lake, Palynological sites - Cagaloq Lake (formerly Lake Hill Lake), Plant macrofossils, Insect macrofossils - beetles, Discussion

Haag, W. G.

1973 The Bering Strait Land Bridge. In *Early Man in America: Readings from Scientific American*, pp. 11-18. W. H. Freeman and Company, San Franciso, California.

Notes: Readings compiled by R. S. MacNeish.

Location: AEU HSS E 61 M16
Area: Western Beringia, Eastern Beringia
Topics: Beringian land bridge connection, Sea level changes, Human migration, Faunal migration, Glacial history

Harington, C. R.
1974 Animal Life in the Ice Age. Canadian Geographical Journal 88(4):38-43.

Location: AEU PMC G 1 C21
Area: Eastern Beringia
Topics: Palaeontological sites - Eastern Beringia, Palaeontological sites - Baillie Islands, Palaeontological sites - Old Crow, Faunal remains - Eastern Beringia, Vegetation history - Eastern Beringia, Insect macrofossils, Plant macrofossils, Ostracodes, Molluscs, Beringian vegetation

Harington, C. R., R. Bonnichsen, and R. E. Morlan
1975 Bones Say Man Lived in Yukon 27,000 Years Ago. Canadian Geographical Journal 91(1 & 2):42-48.

Location: AEU PMC G 1 C21
Area: Yukon - northern, Eastern Beringia
Topics: Human migration, Faunal remains - Yukon, Palaeontological sites - Old Crow, Palaeontological sites - Yukon, Taphonomy, Bone modification, Beringian environment

Irving, W. N.
1987 New Dates from Old Bones. Natural History 96(2):8-13.

Location: AEU SCI QH 1 N28
Area: Yukon - northern, Eastern Beringia
Topics: Palaeontological sites - Old Crow, Tool technology - modern, Bone modification, Faunal remains - Yukon, Plant macrofossils, Dating, Lithic affinities

Kaizuka, S., and Y. Ota
1978 Land in Torment. The Geographical Magazine 51(5):345-352.

Location: AEU PMC G 1 G346
Area: Japan
Topics: Glacial history - Japan, Tephra - Japan, Tectonism, Sea level changes, Faunal remains - *Palaeoloxodon naumanni*, Archaeology - Japan, Geomorphology - terraces

Morlan, R. E., and J. V. Matthews Jr.
1978 New Dates for Early Man. Geos(Winter):2-5.

New finds that indicate man was in North America long before some archaeologists previously thought are being uncovered in the Northern Yukon. Bone tools and other bones broken by man more than 30 000 years ago have been found in an area that escaped coverage by ice in the Pleistocene age. Previous estimates by some archaeologists had put the first human inhabitants at 14 000 years ago.

Notes: Introduction used as abstract.
Location: AEU SCI TN 1 G35
Area: Yukon - northern, Eastern Beringia
Topics: Bone modification, Palaeontological sites - Old Crow, Refugia, Human migration, Geoarchaeology, Faunal remains, Beringian environment, Pollen records, Glacial history, Glacial lake sequences,

Climate history, Insect macrofossils, Plant macrofossils - *Najas flexilis*, Plant macrofossils - *Ranunculus cymbalaria*

Olsen, S. J.

1984 Pleistocene Faunas: North America. The Quarterly Review of Archaeology 5(3):1, 2, 6.

Notes: Review of *Contributions in Quaternary Vertebrate Paleontology: A Volume in Memorial to John E. Guilday* edited by H. H. Genoways and M. R. Dawson (1984).
Area: Eastern Beringia, North America
Topics: Megafauna, Palaeontology, Faunal remains, Book review

1984 Pleistocene Animal Extinctions. The Quarterly Review of Archaeology 5(4):8-10.

Notes: Review of *Quaternary Extinctions* edited by P. S. Martin and R. G. Klein (1984).
Area: North America, China
Topics: Palaeontology, Faunal extinction, Faunal remains, Book review

Ono, Y., K. Hirakawa, and S. Iwata

1982 Meeting and Field Excursion of the International Geographical Union Co-Ordinating Committee for Periglacial Research, Hokkaido, Japan, August 1980. Arctic and Alpine Research 14:167-172.

Location: AEU SCI G 1 A68
Area: Japan - Hokkaido
Topics: Conference report, Stratigraphy, Periglacial features, Tephra - Japan

Pécsi, M.

1987 International Loess Symposium in China, Xian, Shaanxi Province, October 5-16 1985. GeoJournal 14(4):435-445.

Location: AEU SCI QE 1 G295
Area: China - north-central
Topics: Loess, Stratigraphy, Palaeosols, Conference report

Péwé, T. L.

1973 Permafrost Conference in Siberia. Geotimes 18(12):23-26.

Location: AEU SCI QE 1 G356
Area: Siberia, Western Beringia
Topics: Conference report, Periglacial features, Permafrost, Loess

Shih Ya-feng, Li Chi-chun, and Cheng Hsing

1979 Quaternary China. The Geographical Magazine 51(9):636-643.

Location: AEU PMC G 1 G346
Area: China - northern
Topics: Archaeological sites - Zhoukoudian, Glacial history - China, Loess, Stratigraphy, Faunal remains - China, Sea level changes

Solecki, R.

1973 How Man Came to North America. In *Early Man in America: Readings from Scientific American*, pp. 19-23. W. H. Freeman and Company, San Francisco, California.

Notes: Readings compiled by R. S. MacNeish. Article dated January 1951.
Location: AEU HSS E 61 M16
Area: Eastern Beringia, Alaska
Topics: Human migration, Ice-free corridor, Beringian land bridge connection, Archaeological sites - Alaska, Faunal remains - Alaska

Sprague, R.

1983 Bibliographic Control of Northwest Archaeology. The Quarterly Review of Archaeology 4(1):6-7.

Notes: Review of "A Preliminary Bibliography of Washington Archaeology by R. Sprague (1967), Northwest Anthropological Research Notes 1, "Bibliography of the Archaeology of British Columbia" by K. R. Fladmark (1970) in BC Studies Numbers 6 and 7:124-151, *A Bibliographic Guide to the Archaeology of Oregon and Adjacent Regions* by L. Johnson Jr. and D. L. Cole (1972), "Alaskan Archaeology: A Bibliography" by K. W. Workman (1974), Miscellaneous Publications, History and Archaeology Series Number 1, and "A Bibliography of Idaho Archaeology, 1889-1976" by M. G. Pavesic, M. G. Plew and R. Sprague (1979), Northwest Anthropological Research Notes, Memoir Number 5.
Area: British Columbia, Washington - western
Topics: Bibliography, Book review

Stirling, J.

1977 Digging Old Crow ... the Oldest Evidence of Man in North America? North/Nord 24(6):2-5.

Notes: Article describes the field work at Old Crow.
Location: AEU GOV DOC CA1 R 71-10
Area: Eastern Beringia, Yukon - northern
Topics: Palaeontological sites - Old Crow, Faunal remains - Yukon

Turner II, C. G.

1984 Black Sea to Bering Strait. The Quarterly Review of Archaeology 5(3):5.

Notes: Review of *Physical Anthropology of Soviet Asia* by V. P. Alexseev and I. I. Gokhman (1983).
Area: Western Beringia, Siberia
Topics: Dentition, Book review, Hominid evolution, Human migration

1985 The Modern Human Dispersal Event: The Eastern Frontier. The Quarterly Review of Archaeology 6(4):8-10.

Notes: Review of *Out of Asia. Peopling of the Americas and the Pacific* edited by R. Kirk and E. Szathmary (1985).
Area: Beringia, Siberia, Japan
Topics: Book review, Multivariate statistics, Linguistics, Hominid evolution, Human genetics, Human migration

1987 Telltale Teeth. Natural History 96(1):6-10.

Location: AEU SCI QH 1 N28
Area: China, Western Beringia, Eastern Beringia
Topics: Dentition, Human genetics, Human migration

1989 The Fossil Man Hall of Fame. The Review of Archaeology 10(1):42-46.

Notes: Reprinted from The Quarterly Review of Archaeology 9(2), (1988). Review of *Guide to Fossil Man* by M. H. Day (1986).
Area: China, Japan
Topics: Book review, Discussion, Human migration, Human genetics, Hominid evolution, Human/hominid remains

Velitchko, A. A.

1979 Soviet Glaciers were Late Developers. The Geographical Magazine 51(7):472-478.

Location: AEU PMC G 1 G346
Area: Eastern Beringia
Topics: Glacial history - Eastern Beringia, Vegetation history - Eastern Beringia, Faunal remains - *Mammuthus*, Periglacial features, Glacial dynamics

West, F. H.

1981 First Americans: The View from 17th and M. The Quarterly Review of Archaeology 2(1):18-20.

Notes: Review of "The Search for the First Americans" by T. Y. Canby (1979), National Geographic 156(3):330-363.
Area: North America, Beringia, China - northeastern
Topics: Human migration, Palaeontological sites - Old Crow, Archaeological sites, Bone modification

1981 A Matter of Time. The Quarterly Review of Archaeology 2(4):4-5.

Notes: Review of "Western Arctic and Sub-Arctic" by D. D. Anderson (1978) in *Chronologies in New World Archaeology* edited by R. E. Taylor and C. W. Meighan.
Area: Eastern Beringia, Alaska, Yukon, Aleutian Islands
Topics: Palaeontological sites - Old Crow, Archaeological sites - Dry Creek, Lithics, Dating - apatite, Archaeological sites - Anangula, Archaeological sites - Alaska

1983 Bone Age Beringia. The Quarterly Review of Archaeology 4(1):13-16.

Notes: Review of *Taphonomy and Archaeology in the Upper Pleistocene of the Northern Yukon Territory: A Glimpse of the Peopling of the New World* by R. E. Morlan (1980).
Area: Yukon - northern, Eastern Beringia
Topics: Lithics, Book review, Discussion, Palaeontological sites - Old Crow, Taphonomy, Bone modification

1986 American Antiquity: The Long View. The Quarterly Review of Archaeology 7(1):11-13.

Notes: Discussion of "Context and Chronology of Early Man in the Americas" by W. N. Irving (1985) in Annual Review of Anthropology 14:529-555.
Area: Eastern Beringia, Yukon - northern, Beringia, China - northern
Topics: Archaeological sites - Zhoukoudian, Discussion, Human migration, Palaeontological sites - Old Crow, Hominid evolution

1987 Migrationism and New World Origins. The Quarterly Review of Archaeology 8(1):11-14.

Notes: Reprinted in The Review of Archaeology 10(1):158-166 (1989) with author's introduction. Review of "The Settlement of the Americas: A Comparison of the Linguistic, Dental, and Genetic Evidence" by J. H. Greenberg, C. G. Turner II, and S. L. Zegura (1986) in Current Anthropology 27(5):477-497.
Area: North America, China - northern, Alaska, Eastern Beringia, Siberia, Western Beringia

Topics: Lithics, Discussion, Human migration, Linguistics, Dentition, Human genetics, Archaeological sites - Dry Creek, Cultural traditions - Diuktai, Archaeological sites - Anangula

1987 The Development of a Culture. The Quarterly Review of Archaeology 8(2):14-16.

Notes: Review of *British Columbia Prehistory* by K. R. Fladmark (1986).
Area: British Columbia, British Columbia - Queen Charlotte Islands
Topics: Archaeological sites - Charlie Lake Cave, Lithics, Book review, Ice-free corridor, Sea level changes, Archaeological sites - British Columbia, Human migration, Lithics

1988 Report on a Major Site. The Quarterly Review of Archaeology 9(4):10-12.

Notes: Review of "Onion Portage: The Archaeology of a Stratified Site from the Kobuk River, Northwest Alaska" by D. D. Anderson (1988), Anthropological Papers of the University of Alaska 20.
Area: Alaska - northwestern, Eastern Beringia
Topics: Archaeological sites - Onion Portage, Lithics, Cultural traditions - Diuktai, Book review

Young, S. B.

1988 Beringia: An Ice Age View. In *Crossroads of Continents: Cultures of Siberia and Alaska*, edited by W. W. Fitzhugh and A. Crowell, pp. 106-110. Smithsonian Institution Press, Washington, D.C.

Location: AEU HSS GN 635 S5 C95
Area: Beringia
Topics: Sea level changes, Glacial history, Beringian ecology, Human migration, Archaeological sites

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*3. Prehistoric Survey of the Lower Red Deer River, 1975. By Gary Adams. 140 pp. 1976.

*4. Archaeology in Alberta, 1976. Compiled by J. Michael Quigg. 103 pp. 1977.

*5. Archaeology in Alberta, 1977. Compiled by W. J. Byrne. 141 pp. 1978.

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7. Studies in Archaeology, Highway 1A, Coal Creek, Alberta. By Michael McIntyre. 171 pp. 1978.

*8. The Lazy Dog Tipi Ring Site. By J. Michael Quigg. 49 pp. 1978. (Bound with No. 9).

*9. The Alkali Creek Sites; The Lower Red Deer River. By Gary Adams. 127 pp. 1978. (Bound with No. 8).

*10. Cypress Hills Ethnology and Ecology: A Regional Perspective. By Rob Bonnichsen and S. J. Baldwin. 87 pp. 1978.

*11. The Elk Point Burial: At the Place of the Willows. By Stuart J. Baldwin. 74 pp. 1978.

*12. Archaeological Investigations at Writing-On-Stone. By J. W. Brink. 73 pp. 1979. (Bound with No. 13).

*13. Stone Circles at Chin Coulee. By James H. Calder. 70 pp. 1979 (Bound with No. 12).

*14. Archaeology in Alberta, 1978. Compiled by J. M. Hillerud. 192 pp. 1979.

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22. Sibbald Creek: 11,000 Years of Human Use of the Alberta Foothills. By Eugene M. Gryba. 219 pp. 1983.

23. Archaeology in Alberta, 1983. Compiled by David Burley. 256 pp. 1984.

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25. Archaeology in Alberta, 1984. Compiled by David Burley. 277 pp. 1985.

26. Contributions to Plains Prehistory. Edited by David Burley. 284 pp. 1985.

*27. Alberta Plains Prehistory: A Review. By J. Roderick Vickers. 139 pp. 1986. (Bound with No. 28).

*28. Dog Days in Southern Alberta. By Jack Brink. 70 pp. 1986. (Bound with No. 27).

29. Archaeology in Alberta, 1985. Compiled by John W. Ives. 287 pp. 1986.

30. Eastern Slopes Prehistory: Selected Papers. Edited by Brian Ronaghan. 405 pp. 1986.
31. Archaeology in Alberta, 1986. Compiled by Martin Magne. 302 pp. 1987.
32. Archaeology in Alberta, 1987. Compiled by Martin Magne. 244 pp. 1988.
33. Archaeology in Alberta, 1988 and 1989. Edited by Martin Magne. 427 pp. 1991.
34. Archaeological Investigations at Historic Waterhole. By Walt Kowal. 306 pp. 1992.
35. Late Quaternary Studies in Beringia and Beyond, 1950-1993: An Annotated Bibliography. By Alwynne B. Beaudoin and Frances D. Reintjes. 386 pp. 1994.

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