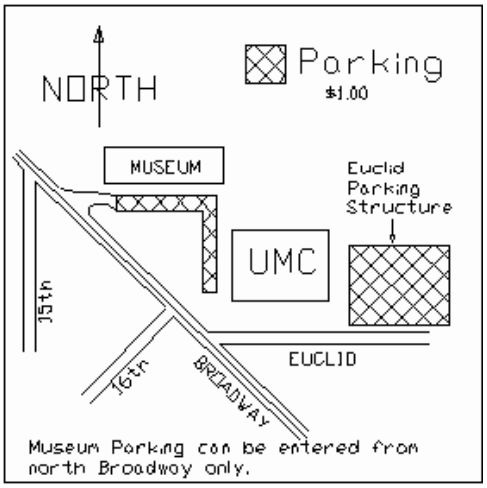
CALUMET

CONSERVATION PRESERVATION
EDUCATION EXPLORATION

Newsletter of the Indian Peaks Chapter of the Colorado Archaeological Society
October, 2001

CALENDAR OF EVENTS

General (lecture) meetings are held in the University of Colorado Museum, Dinosaur Room Second Thursday of each Month, at 7:00 PM. The public is always welcome.



The following is a situation that will last through next summer:
I'm sure you noticed that our Museum parking lot 208 is off limits to non-permit holders, even at night. So, would you please pass that on to your members? They can park in the Euclid parking structure for $1.25. Euclid parking lot is east of the Museum on Euclid. Just want to avoid tickets and towing.
Thanks, Carol Kliger

After parking in the Euclid Parking Structure, walk west on Euclid to Broadway, follow Broadway on the sidewalk for one block and drop down into the Museum parking lot. It is only a few hundred yards.

October 4 **Executive Board -** 7:30 PM at Alterra at The Atrium**.**

October 4 PAAC Class - Denver, RD&R Writing (session 3)

October 5-7 Colorado Archaeological Society & PAAC Board annual meeting, in Fort Collins

October 9 PAAC Class - Fort Collins, Colorado Archaeology

Inside This CALUMET

October 11 **IPCAS Presentation** - 7 PM in the Dinosaur Room at CU museum. Presenter: Jim Dixon. The topic will be the "The First Americans".

October 11 PAAC Class - Denver, RD&R Writing (session 4)

October 16 PAAC Class - Fort Collins, Colorado Archaeology (session 2)

October 16 AIA Lecture - Prof. E. Hector Williams, University of British Columbia
Topic: Excavations in Arkadia: Ancient Stymphalos

All AIA lectures are co-sponsored with the University of Colorado Natural History Museum and the Department of Classics, free to the public, and presented at 6:30 p.m. at the Museum, which is located at 15th Street and Broadway in Boulder.

Calendar of Events - Continued

October 18 PAAC Class - Denver, RD&R Writing (session 5)

October 23-30 PAAC Class - Fort Collins, Colorado Archaeology (sessions 3 and 4)

October 30 AIA Lecture - Prof. Jonathan D. Kent, Metropolitan State College
Topic: Archaeological Investigations in the Middle Chao Valley, Northern Peru

All AIA lectures are co-sponsored with the University of Colorado Natural History Museum and the Department of Classics, free to the public, and presented at 6:30 p.m. at the Museum, which is located at 15th Street and Broadway in Boulder.

October 31-November 3 Plains Anthropological Conference, in Lincoln, NE.

November 1 Executive Board - 7:30 PM at Alterra at The Atrium**.**

November 6 PAAC Class - Fort Collins, Colorado Archaeology (session 5)

November 7 PAAC Class - Archaeological Dating Methods, Boulder Wildlife Center

November 8 IPCAS Presentation - 7 PM in the Dinosaur Room at CU museum. Presenter: Marcel Kornfeld. The topic will be the "Paleoindian Prehistory in Middle Park".

November 13 PAAC Class - Fort Collins, Colorado Archaeology (session 6)

November 14 PAAC Class - Archaeological Dating Methods (session 2), Boulder Wildlife Center

November 20 PAAC Class - Fort Collins, Colorado Archaeology (session 7)

November 28 PAAC Class - Archaeological Dating Methods (session 3), Boulder Wildlife Center

December 4 AIA Lecture - Ms. Lisa M. Capano, Painting Conservator
Paintings Conservation and Restoration

All AIA lectures are co-sponsored with the University of Colorado Natural History Museum and the Department of Classics, free to the public, and presented at 6:30 p.m. at the Museum, which is located at 15th Street and Broadway in Boulder.

December 5 PAAC Class - Archaeological Dating Methods (session 4), Boulder Wildlife Center

December 6 Executive Board - 7:30 PM at Alterra at The Atrium**.**

December 13 Annual Holiday Party - 7:30 PM, location to be announced**.** A great social activity and do not forget the famous "White Mammoth Exchange".

Officers and Board Members Needed

Our club needs some candidates for the November election. IPCAS has the following open slots in the slate of candidates:

Vice-President - Performs the President's duties in that officer's absence; Arranges and presents each monthly chapter program; Arranges special events and appoints assistants as necessary; Arranges for PAAC classes with the PAAC Training Coordinator; Collects, deposits, dispenses and reports all moneys connected with special events and makes final written report to the Treasurer and Executive Board.

Treasurer - Collects and records all funds, deposits and disburses funds and presents an itemized statement of chapter finances at each Executive Board meeting; Responsible for forms and reports of finances of the chapter to be made to the State C.A.S.

CAS Representative - Attends all quarterly and annual meetings of C.A.S.; Reports to the Executive Board.

Board Member - Attends all Executive Board meetings; Provides advice and guidance; Assists the officers and membership.

Using A Scanner to Record Arrowheads

SAA Bulletin and the Center for Archaeological Research, University of Texas

Scanning artifacts has numerous uses of immediate relevance to archaeologists. First, scanned images may be published in archaeological reports in lieu of artifact photographs. Second, images may be stored digitally as a form of archival record. Third, images, because they are digital information, may be easily transmitted via the Internet or published online. This is an extremely useful way to distribute information to other researchers worldwide to elicit comparisons or analysis of a particular artifact. At CAR, we have primarily used the scanned images to publish the artifacts in our printed reports.

We use a Hewlett-Packard (HP) ScanJet 4c flatbed scanner. This particular scanner has a single fluorescent lamp and uses a charged-coupled device scanning element. The optical resolution is 600 dots per inch (dpi) with a selectable resolution of 12 to 2250 dpi at 100 percent scaling (Hewlett-Packard 1995a, *Installing the HP ScanJet 4c Scanner. Publication* No. C2522-90003. Hewlett-Packard, Palo Alto, Calif.). The HP ScanJet 4c can scale the objects it is scanning from 2 to 375 percent in one percent increments at 600 dpi (HP 1995a). At CAR, our scanner is connected to a Compaq DeskPro running Windows 95, but we have used the same techniques on a Macintosh PowerPC. On machines running either Windows 95 or Macintosh OS 8.0, we use HP DeskScan II software to control the settings on the scanner. DeskScan II is usually included with the scanner, but, if not, it is available online from Hewlett-Packard at **www.hp.com**. Once an artifact is scanned, the image can be manipulated using a variety of software applications. For the examples in this article we relied on Adobe Photoshop LE, a program that came free with the purchase of the scanner. Today, comparable HP scanners retail for between $300 and $800.

To demonstrate the versatility of this technique, we present several examples. The first is a chert dart point. The second is a cow rib with butchery marks made with a metal tool. The latter demonstrates the ability of the scanner to accurately image larger three-dimensional objects. We also present a series of scanned images of different artifact types as examples of the versatility of the technology. In most cases, the process involves several steps: scanning the artifact to the appropriate scale, adjusting the image using DeskScan II, saving the image as a computer file, and manipulating the image using Photoshop LE.

Before scanning an artifact, several important decisions must be made. The resolution at which the image will be scanned and the type of image to be produced (i.e., color or black-and-white) must be selected. Generally, the end result of the process guides these two decisions. As discussed below, file size increases with resolution. Therefore, computer memory limitations and the final output resolution (i.e., for Internet publishing at low resolution or printing in a technical report at high resolution) generally dictate the scanner settings.

The HP DeskScan II software allows the user to set the *image type*, *print path*, and *scaling* before scanning. The *image type* menu includes items such as black and white photo, sharp black and white photo, color photo, color photo, sharp color photo, millions of colors, and sharp millions of colors, along with a variety of halftone and line art options. The print path menu allows you to select the dpi above which the image will be scanned (Hewlett-Packard 1995b, *HP DeskScan II User's Guide. Publication N*o. C2522-90002. Hewlett-Packard, Palo Alto, Calif.). The image may be scaled before scanning as discussed.

Our first example is a Pedernales point from Central Texas. This point is made of a brown, fine-grained chert. We have included a drawing of the artifact for comparative purposes (Figure 1a). The first step is to place a clear piece of plastic on the surface of the scanner bed. This prevents sharp objects from scratching the scanner's glass plate. We use a sheet of blank overhead transparency film. The artifact is then placed on the plastic and the lid to the scanner gently closed to hold the artifact still. Depending on the thickness of the artifact, however, it may be impossible to close the lid. Leaving the lid open results in a black background around the object.

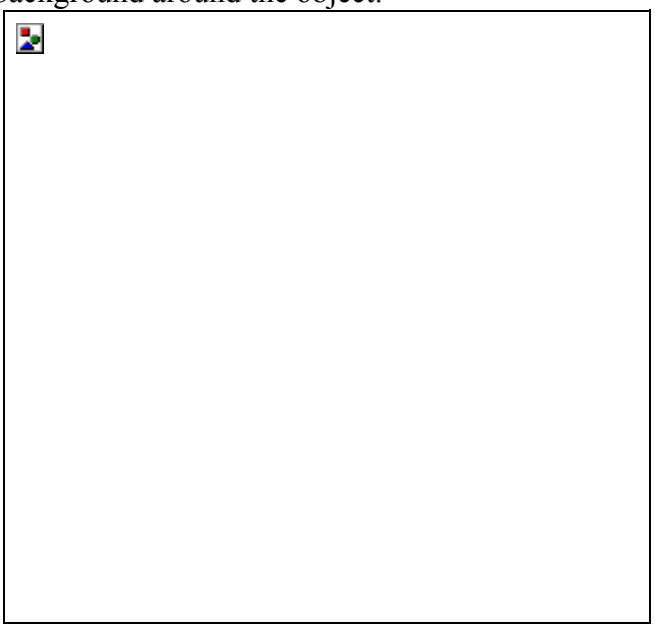


Figure 1: Pedernales dart point made of fine grained chert. (a) line drawing; (b) original scanned image; (c) scanned image with gray background erased.

Our example was scanned at 300 dpi, as a sharp black and white photograph, at 100 percent. To scan the image, we first used the preview option on the DeskScan II software and then selected the final area we wanted to scan. We also used the automatic exposure option to adjust the brightness and contrast of the image. This was done by first selecting a section of the preview image of the projectile point and a small section of the gray background and then clicking the automatic exposure button. The contrast and brightness also may be manipulated individually, but we have found that the automatic exposure is fairly consistent and produces a good image. For final scanning, we selected an area just slightly larger than the projectile point to minimize file size. The image was then saved as a Tag Image File Format (TIFF) file directly from the DeskScan II program (Figure 1b). The area around the artifact appears as a light gray background because the artifact prevents the scanner's white lid from contacting the flatbed surface. Had the artifact been thicker, the background would have been darker.

We then used Adobe Photoshop LE to open the TIFF. In Photoshop, we used the eraser tool to remove the gray background around the point (Figure 1c). The file was then saved, again as a TIFF in this case. Other file formats should be considered depending on the intended use of the image. For example, both Joint Photographic Experts Group (JPEG) files and Graphics Interchange Format (GIF) files are suitable for publishing on the Internet.

Our second example is a fragment of a cow rib from 41BX437, a Spanish colonial site associated with the Alamo in downtown San Antonio. This piece demonstrates the depth to which the flatbed scanner can "see" a three-dimensional artifact, the utility of zooming in on a section of an artifact using the scaling feature, and the ability to annotate the image using Photoshop. The particular piece of bone we selected measures 265 mm long by 55 wide by 14 mm thick (Figure 2). This object was scanned at 75 percent actual size as a sharp black and white photograph at 300 dpi, with the automatic exposure option.

As is shown in Figure 2, the scanner does an excellent job of imaging an artifact of this size. The sharpness of the image decreases with distance, but detail is still discernible as far as 18 mm. This file was also saved as a TIFF.

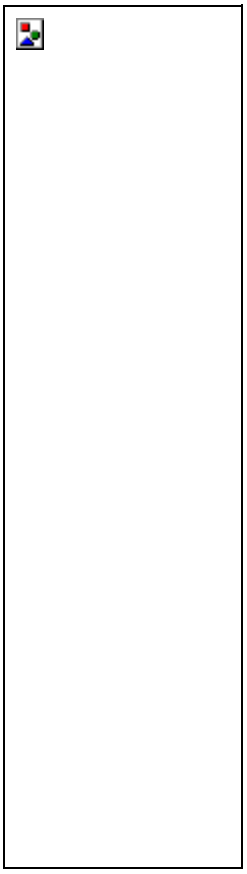


Figure 2: Scanned bone with butcher marks. Depths from scanner surface to representative points on the bone are indicated. Area enlarged in Figure 3 is indicated by the dashed line.

An extremely useful feature of the scanner is its ability to scale an image prior to scanning it, thereby maintaining the desired resolution. As an example, we zoomed in on the area of the bone marked by the dotted line in Figure 2 to produce Figure 3. Figure 3 was scanned with a path of 300 dpi at 300 percent. The contrast and brightness were then adjusted manually to highlight the indicated butcher marks.

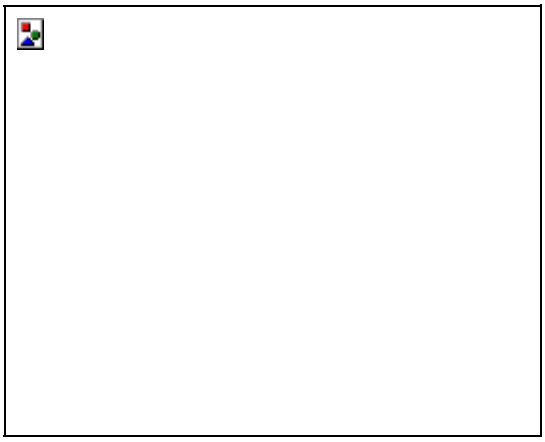


Figure 3: Area of bone scanned at 300 percent to highlight butcher marks and demonstrate scaling technique.

The two most important limitations to this technology are the distance to which the scanner can adequately "see" an artifact, and the dramatic increase in file size with increasing resolution. To test the depth of field of the scanner, we placed a specially created ruler with the zero millimeters point directly on the scanner's surface and then tilted at a 45deg. angle. The tick marks on the ruler indicate the distance at that point from the scanner's surface, not the horizontal distance along the scale (Figure 4). This object was scanned at 300 dpi as a sharp black and white photograph. The brightness and contrast settings on the DeskScan II software were 180 and 200, respectively. The file was saved as a TIFF.

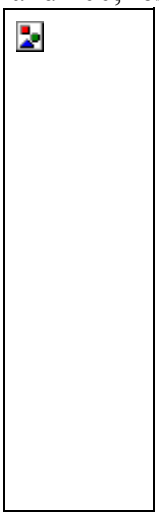


Figure 4: Scale measuring the distance to which the scanner can "see" objects. The tick marks on this scale indicate distances from the scanner surface.

This test of the scanner demonstrates clearly the decrease in sharpness and the increase in darkness that occur with distance. The scanner does a good job of recording the ruler to a distance of approximately 12 mm. Between approximately 12 and 20 mm, the text is still easily read, but the image is darker and the lines begin to lose their sharpness. After about 27 mm, the image becomes very dark, the text illegible, and the lines fuzzy.

To test the effects of increasing an image's scanned resolution, we used the projectile point from our first example and scanned it at 50 percent normal size at increments of 100 dpi (Figure 5). In all cases, the artifact was scanned as a sharp black and white photograph with constant brightness and contrast levels and saved as a TIFF. At 100 dpi, the image required only 18 kilobytes (k) of disk space to save. At 600 dpi, it required 660k. The original full-size image required 660k at 300 dpi. Figure 5 demonstrates the differences in image quality and file size at different resolutions.

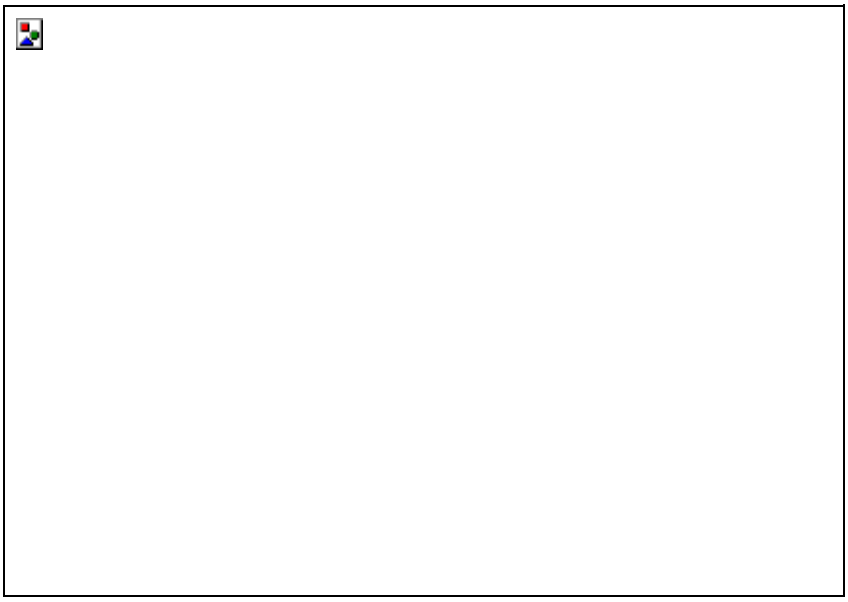


Figure 5: The difference in image quality and file size at different resolutions.

One distinct advantage that high dpi images have, however, is that it is possible to resample the image's resolution downward without decreasing its length or width. For example, a 4-x-6-inch, 600 dpi image can be converted to a 300 dpi image of the same dimensions using Photoshop or a similar software package, but a 300 dpi image cannot be resampled to a 600 dpi image without a proportionate reduction in its dimensions. Similarly, a 600 dpi image can be enlarged to show detail and still retain a high resolution, as is illustrated in Figure 5.

The scanner cannot be used to produce images of very large or heavy artifacts. The maximum scanning area is 216 x 356 mm (HP 1995a). We could not find a maximum weight that the scanner bed can support in the HP documentation, and we decided not to test it ourselves. We do not recommend trying to scan heavy artifacts such as metates, large celts, or carved stone monuments!

While this unusual use of flatbed scanner technology has important limitations, it also has advantages over other means of imaging artifacts. Most archaeological firms and universities already use flatbed scanners regularly to scan documents. To use the scanner to document artifacts, the only additional hardware upgrade is a piece of clear overhead transparency film. Most scanners come with some limited image manipulating software package. Commercially, Adobe Photoshop 4.0, the full-featured version of Photoshop LE, retails for around $400. The price is substantially less for the educational version of the software.

The process has important advantages over photographing or illustrating artifacts. It is relatively quick and can be completed entirely in house. More importantly, the quality of the final image is immediately known, unlike artifacts shot on film that must be processed. The quality of the images, while dependent on the various factors discussed above, is generally very high. Because the images are already in digital form, they can be manipulated and placed into manuscripts easily. Perhaps the most important advantage is cost. A scanned image costs very little to produce; essentially, once the scanner and necessary software have been purchased, the only cost is the time of the person doing the scanning. "Reprints" of the image as computer files or printed copies are also virtually free and easily made.

We have included several examples of the range of artifacts that we have scanned in Figure 6. Some of these images have had the background erased, while others have not. Each of these examples was scanned at 300 dpi as a sharp black and white photograph. It is possible to add a different background to an image using Photoshop or a similar software package. This is particularly useful for color images published online.

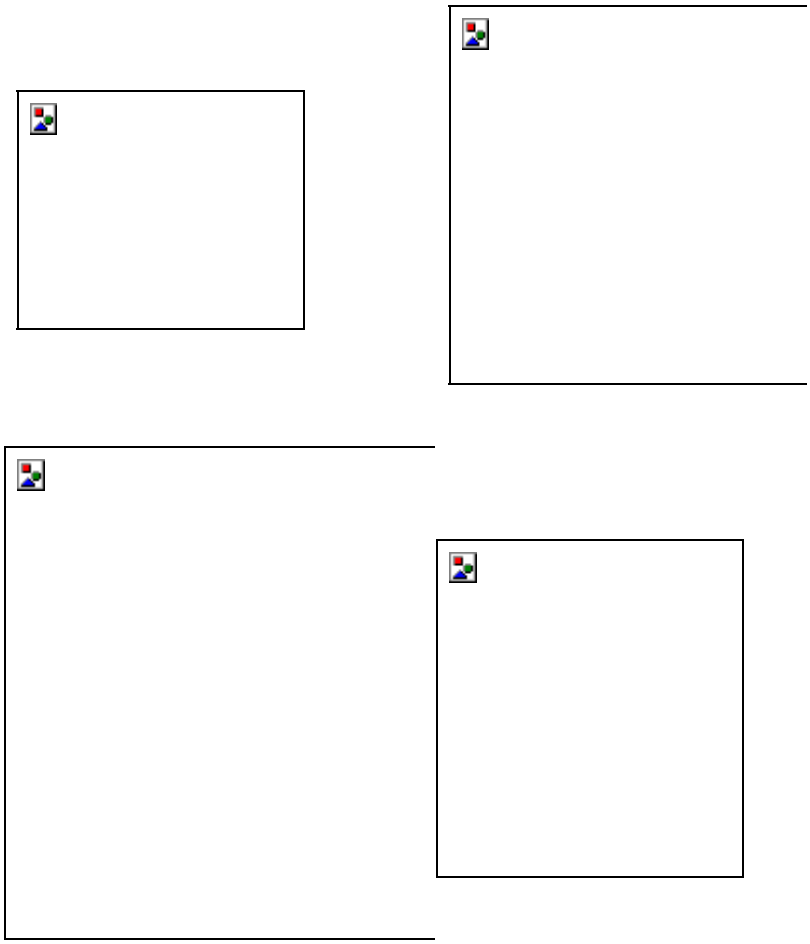


Figure 6: Examples of scanned artifacts. (a) sherd of Puebla Polychrome (A.D. 1675 to 1720) with background erased; (b) fragment of fiber sandal from West Texas; (c) ceramic figurine from Mesoamerica with distances from scanner surface indicated and background erased; (d) sherd of Galera Polychrome (A.D. 1750 to 1800).

Students faced with trying to produce a high-quality dissertation or thesis at a low cost should find this technology extremely helpful. Professionals should benefit from its versatility and cost effectiveness as a tool for archiving images, sharing data over the Internet, and producing technical reports. While we have only been experimenting with this technology for about a year and our techniques are not completely refined, we are extremely pleased with the results thus far.

We cannot take credit for coming up with the great idea to scan artifacts. At CAR, our thanks goes to John Arnn for first suggesting the idea and to Steve Tomka for first trying it. We would also like to thank Robert Hard, the director, for allowing us to experiment with this technology, C. Britt Bousman for reading an early draft of this manuscript and making valuable suggestions, Barbara Meissner for coming up with the cow rib we used in the article, and Marcie Renner for editing this manuscript. Finally, Sam Wilson of the University of Texas at Austin, who has been independently experimenting with this approach, graciously provided comments on this manuscript.

Brett A. Houk and Bruce K. Moses are both at the Center for Archaeological Research at the University of Texas, San Antonio.

The Ice Man Cameth Early

Early mammoth hunters braved the Arctic.

Helen Pearson

Our hardy ancestors survived north of the Arctic Circle as far back as the last ice age, unearthed tools now reveal. The mammoth hunters braved sub-zero temperatures on desolate tundra at least 20,000 years earlier than was thought, the remains suggest, although whether the people were Neanderthals or modern humans is a mystery.

The artifacts, dug up in an Arctic riverbed, show that humans once lived as far north as Siberia and Alaska, say archaeologist John Svendsen, of the University of Bergen in Norway, and his team1. The stone tools, horse and reindeer bones and a mammoth tusk with hand-made markings, were found at Mamontovaya Kurya in European Russia. Radiocarbon dating puts the finds between 35,000 and 40,000 years old. Previously, humans were thought to have colonized this northern region in the last stages of the ice age only some 13,000 years ago.

The 40,000-year date "marks a turning point in the history of human evolution in Europe," says Svendsen's team. Around that time, roaming Neanderthals are thought to have given way to anatomically modern humans migrating northwards out of Africa and into Europe. The new haul does not reveal the identity of the Arctic dwellers to be either Neanderthal or modern. Either way the result is exciting, says archaeologist John Gowlett of the University of Liverpool, UK. Either Neanderthals traveled further north than was thought, or modern humans moved and adjusted to northern extremes very quickly - within a few thousand years of leaving hotter climes.

Temperatures seem to have fluctuated markedly at that time, pushing populations north or south. Early modern humans may have followed herds of mammoths, wild horses or reindeer northwards during a warmer period, speculates Gowlett. During colder spells, freezing steppes extended as far south as Greece. "Humans had a hold on the north, if only for a short time," he says.

To survive at these latitudes, humans have to be well adapted, explains anthropologist Chris Stringer of the Natural History Museum in London. Temperatures fall to -40°C and there is 24-hour darkness for part of the year. "You've got to have clothing, housing and fire," he says. Eating meat and fat would have been important, as there are few plants. Cold-dwelling populations such as the Inuits also have physiological differences that make them more tolerant to the cold.

Whereas modern humans are known for their ability to survive in extreme conditions, Neanderthals were thought to lack such skills. If the remains are Neanderthal, then "they were not a load of numb skulls," says Gowlett.

Our view of the historic landscape in which the hunters lived is also changing. The animal bones add to mounting evidence that this region of the Arctic, although cold, was not ice-bound 35,000 years ago. Instead, it probably consisted of open, grassy steppes.

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