MAMMOTH TRUMPET

Volume 33, Number 2 ■ April, 2018

Center for the Study of the First Americans
Department of Anthropology
Texas A&M University
4352 TAMU
College Station, TX 77843-4352
www.centerfirstamericans.com

Progeny of the Beringian Standstill

The remains of Early American Shuká Káa were discovered in 1996 in On Your Knees Cave on Prince of Wales Island in southern Alaska. Now we find that his DNA relates him more closely to Native Americans than to any other population in the world, *including Northern Asians*. See his story on **page 5.**

Shuká Káa adds to mounting evidence for a unique American founding population descended from Siberian colonizers stranded in eastern Beringia by the LGM. Meticulous bone analysis confirms that humans occupied Bluefish Caves in Yukon Territory at the time of the LGM. Following the millennia of the Beringian Standstill, from this isolated gene pool emerged the colonizers who peopled the Americas. This headstone commemorates one of their descendants. Bluefish Caves is our lead story on **page 1.**

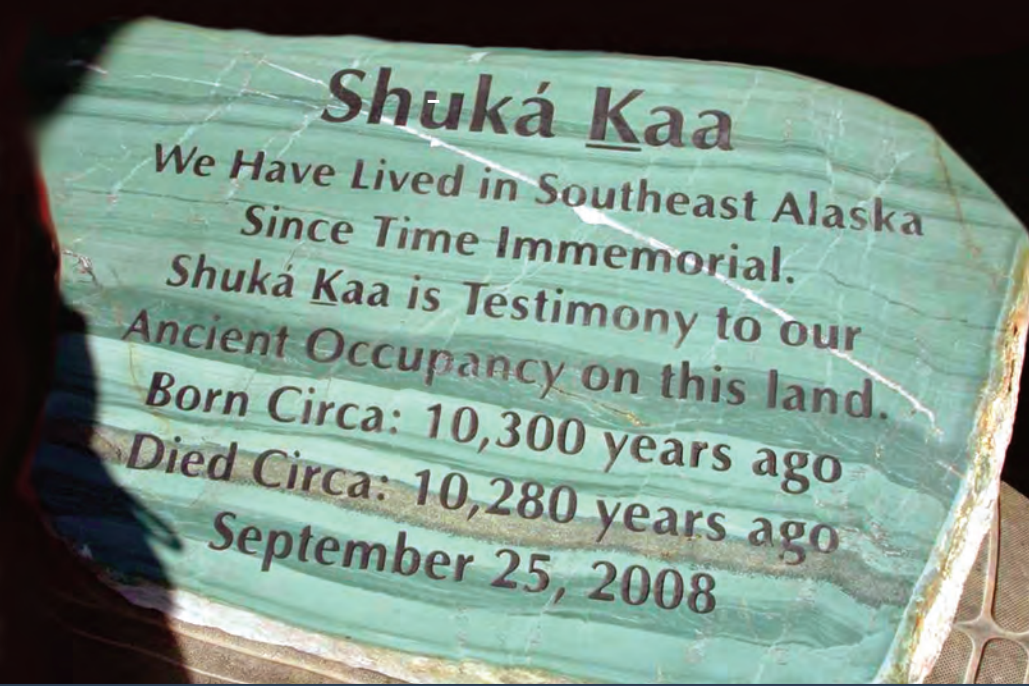


Photo by Terry Fifield, courtesy of Sealaska Heritage Institute

The Center for the Study of the First Americans fosters research and public interest in the Peopling of the Americas. The **Center,** an integral part of the Department of Anthropology at **Texas A&M University,** promotes interdisciplinary scholarly dialogue among physical, geological, biological and social scientists. The **Mammoth Trumpet,** news magazine of the **Center,** seeks to involve you in the peopling of the Americas by reporting on developments in all pertinent areas of knowledge.

Join in the Search for the First Americans!

Become a member of the **Center for the Study of the First Americans** and explore the origin, lifeways, artifacts, and other aspects of the earliest inhabitants of the Americas. As a **Center** member you will receive a 1-year subscription to ***Mammoth Trumpet*** and discounts on **Center** publications plus additional benefits according to the level of membership support you choose. Don't miss out on the latest breaking news and information about the Ice Age colonizers of the Americas while playing a vital role in education and research pursued by the **Center!**

Membership Levels

Core 1-year membership includes:

- 1-year subscription to ***Mammoth Trumpet*** (4 issues!)
- 20% discount on **Center** books distributed by TAMU Press and CSFA.
- Discount on ***PaleoAmerica*** Journal subscription. As a **Core** member you have the option to subscribe to our quarterly scientific journal.

Sustainer 1-year membership includes:

- 1-year subscription to ***Mammoth Trumpet*** (4 issues!)
- 1-year print subscription to ***PaleoAmerica*** journal (4 issues!)
- One free **Center** book distributed by TAMU Press or CSFA, contact the **Center** with book choice.
- A **Center** pin
- 20% discount on **Center** books distributed by TAMU Press and CSFA.

Impact 1-year membership includes all benefits of **Sustainer** membership, plus:

- An additional **Center** book distributed by TAMU Press or CSFA, contact the **Center** with book choices.
- A **Center** coffee mug
- Exclusive behind-the-scenes letters on **Center** activities (3 per year)

To Join or Renew

Select a membership level: **Core**, **Sustainer**, or **Impact**

- To join/renew by mail: Fill out the order form below and mail it with a check or money order payable to **TAMF-CSFA** to:

  CSFA
  Department of Anthropology
  Texas A&M University
  4352 TAMU
  College Station, TX 77843-4352

IMPORTANT!
Make check/m.o. payable to
TAMF–CSFA

- To join/renew by credit card: go to our secure order form on our website at **www.centerfirstamericans.com**

Questions? Call us at 979-845-4046 or e-mail us at csfa@tamu.edu

Membership/Subscription Order Form

	Rates U.S.	Rates International	Total cost
Core membership	$ 30.00	$ 40.00	
Sustainer membership	250.00	250.00	
Impact membership	500.00	500.00	
PaleoAmerica journal *print* subscription discounted rate for Core members	35.00	35.00	
PaleoAmerica journal *electronic* subscription discounted rate for Core members	22.00	22.00	
		Subtotal	
The Center for the Study of the First Americans needs your help! Please consider a donation that will support students and CSFA research.			
		Total	

Please make check or money order payable to: TAMF–CSFA

Ship to (please print clearly)**:**

Name _____

Address _____

City _____ State _____ Zip _____

_____
e-mail address (in case we have a question about your order)

_____
daytime phone (in case we have a question about your order)

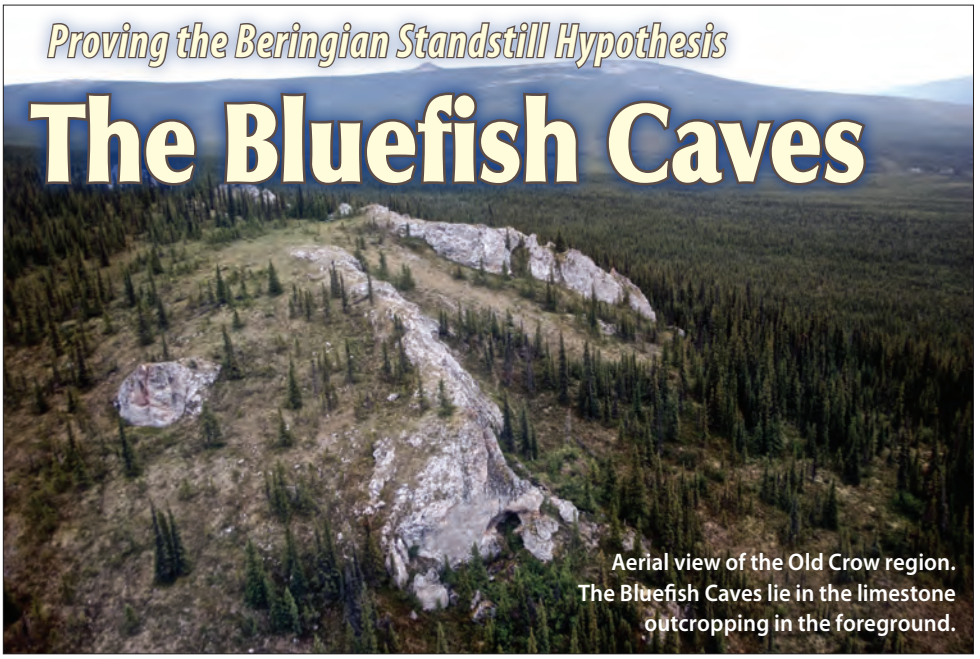
MAMMOTH TRUMPET

Volume 33, Number 2 | Center for the Study of the First Americans | Department of Anthropology
April, 2018 | Texas A&M University, 4352 TAMU, College Station, TX 77843-4352 | ISSN 8755-6898

World Wide Web site **http://centerfirstamericans.com and http://anthropology.tamu.edu**

Proving the Beringian Standstill Hypothesis

The Bluefish Caves



SHIRLEEN SMITH ©VGFN

Aerial view of the Old Crow region. The Bluefish Caves lie in the limestone outcropping in the foreground.

WHEN TRYING TO UNDERSTAND the history and movements of early humans, we can all agree on at least one thing: Humans didn't originate in the Americas. This isn't much help, regrettably, in understanding early human migrations around the globe and how humans eventually arrived in the Western Hemisphere. When did they get here? Where did they come from? What path did they take? Why did they migrate this way?

Theories within the anthropological community about when and how humans first arrived in the Americas run the gamut, from migrating by boat down the Pacific coastline of the Americas (**MT 26-4,** "A story of ancient mariners"; **MT 24-3,** "Putting muscle into coastal-entry research"; **MT 20-4,** "Exploring the Northwest coast: E. James Dixon and the peopling of the New World"; and **MT 17-2,** "The Baja connection"), to traveling from Europe across the Atlantic Ocean (**MT 17-1,** "Immigrants from the other side?"). Kids in a Junior Historians program that this writer teaches even suggested that humans first arrived here because someone in Europe accidentally dropped a baby into the Atlantic Ocean, which obviously meant that everyone had to keep swimming after the baby all the way across the ocean until they all just happened to arrive in North America!

INSIDE

Beringia, a genetic stew pot

An idea about the peopling of the Americas that's gaining traction in the scientific community (based on scientific research, not on swimming babies) is the Beringian Standstill hypothesis. We know that during the last Ice Age in the terminal

Pleistocene Epoch, the immense quantity of water bound up in glaciers lowered the sea level and thereby exposed the Bering Land Bridge, a landscape of grass, herbs, and willow shrubs that connected Siberia with Alaska. The landmass we call Beringia extended from the Lena River in Siberia to the Mackenzie River in the Yukon Territory. It was an extension of the mammoth steppe, which stretched across Eurasia and Canada. The mammoth steppe was home to great herbivores—mammoth, bison, horse, and muskox—and to hunter-gatherers that preyed on them. It was also a convenient passageway, and home, for any Central Asian populations curious to discover what lay past the eastern horizon.

Human populations that we suppose settled along the span of Beringia used it as a glacial refuge, not just a roadway from one continent to the next. Regardless, these groups would have found travel farther eastward blocked by the Cordilleran and Laurentide Ice Sheets anyway. Settling in eastern Beringia, this population, estimated by geneticists as probably numbering no more than a few tens of thousands, became the First Americans (**MT 32-2,** "A high-resolution timeline for peopling of the Americas"). They settled in present-day Alaska and Yukon Territory, and once the glaciers relaxed their grip and opened new lands their descendants began to expand farther southward, perhaps skipping along the coast in boats, or traveling overland by the Ice-Free Corridor (**MT 32-4,** "Was the Ice-Free Corridor the route followed by the First Americans?"). How long was this founding population isolated in Beringia? Long enough to accumulate sufficient genetic diversity to become distinct from their Asian forebears. This great separation is the hypothesized Beringian Standstill. Geneticists estimate its duration at between 2,400 and 9,000 years.

Although this hypothesis is becoming popular with scientists, sufficient supporting archaeological data haven't been gathered to push it forward as the definitive front runner. In particular, the exact timeframe of human expansion from Siberia into North America is an extremely fuzzy area. Until now, archaeological evidence has suggested that humans first inhabited North America around 14,000 CALYBP. If this milestone date holds true, then the estimated duration of 2,400–9,000 years the first migrants spent in Beringia doesn't fit into the equation.

A new model unravels the "migration" knot

Physical anthropologist Lauriane Bourgeon and her supervisor, Ariane Burke, both of Université de Montréal, espouse the model proposed by anthropologist Emőke J. E. Szathmáry of the University of Manitoba. In their view, Central Asians in the late Pleistocene were a homogeneous population that dispersed to the habitable boundaries of the mainland. With the appearance of the Bering Land Bridge, the eastern boundary extended into eastern Beringia. Burke explains that the founding premise of the Standstill

MAMMOTH TRUMPET

The Mammoth Trumpet (ISSN 8755-6898) is published quarterly by the **Center for the Study of the First Americans,** Department of Anthropology, Texas A&M University, College Station, TX 77843-4352. Phone (979) 845-4046; fax (979) 845-4070; e-mail csfa@tamu.edu. Periodical postage paid at College Station, TX 77843-4352 and at additional mailing offices.

POSTMASTER: Send address changes to:

Mammoth Trumpet
Department of Anthropology, Texas A&M University
4352 TAMU
College Station, TX 77843-4352

Michael R. Waters	Director and General Editor e-mail: mwaters@tamu.edu
Ted Goebel	Associate Director and Editor, **PaleoAmerica** e-mail: goebel@tamu.edu
James M. Chandler	Editor, **Mammoth Trumpet** e-mail: wordsmiths@touchnc.net
Christel Cooper	Office Manager e-mail: csfa@tamu.edu
C&C Wordsmiths	Layout and Design
Newman Printing Co.,Inc.	Printing and mailing Web site: www.newmanprint.com
World Wide Web site	http://centerfirstamericans.com

The **Center for the Study of the First Americans** is a non-profit organization. Subscription to the **Mammoth Trumpet** is by membership in the **Center.**

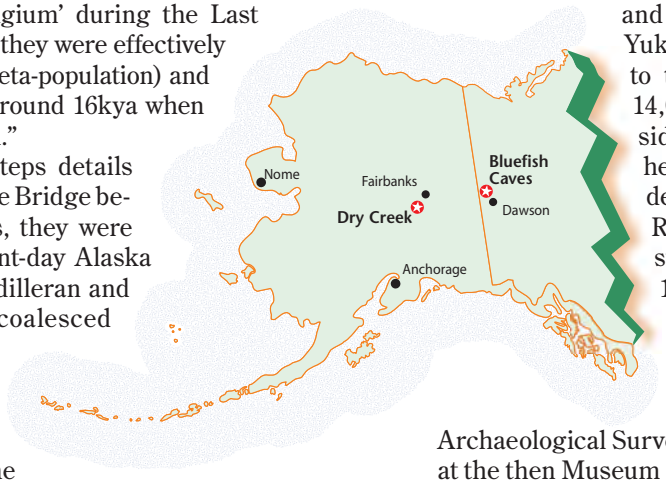
Mammoth Trumpet, Statement of Our Policy

Many years may pass between the time an important discovery is made and the acceptance of research results by the scientific community. To facilitate communication among all parties interested in staying abreast of breaking news in First Americans studies, the **Mammoth Trumpet,** a science news magazine, provides a forum for reporting and discussing new and potentially controversial information important to understanding the peopling of the Americas. We encourage submission of articles to the Managing Editor and letters to the Editor. Views published in the **Mammoth Trumpet** are the views of contributors, and do not reflect the views of the editor or **Center** personnel.

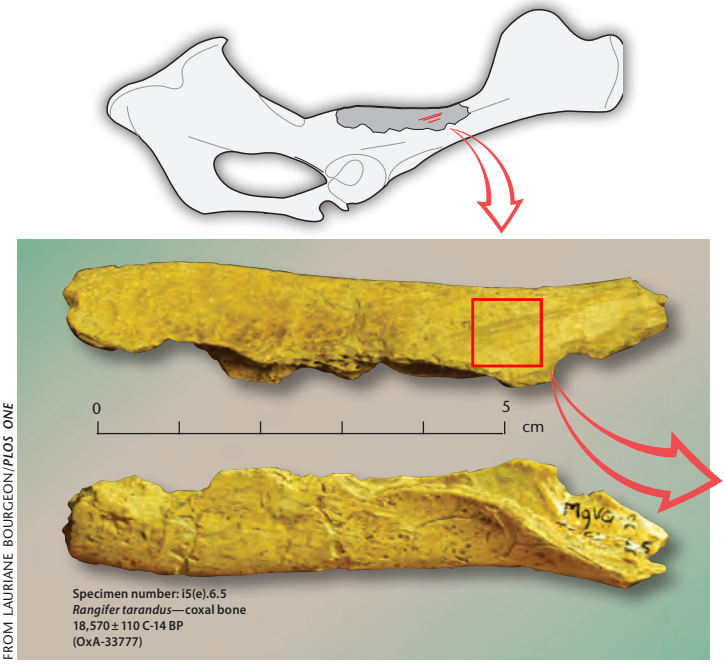
–Michael R. Waters, Director

hypothesis is that "Central Asian populations that lived in Beringia during the late Pleistocene likely contracted their range to a central Beringian 'refugium' during the Last Glacial Maximum (where they were effectively isolated from the larger meta-population) and re-expanded from there around 16kya when climate conditions relaxed."

This hypothesis sidesteps details of when Asians crossed the Bridge because, Szathmáry argues, they were already in place in present-day Alaska and Yukon when the Cordilleran and Laurentide Ice Sheets coalesced during the Last Glacial Maximum (LGM), effectively confining them to eastern Beringia for millennia. Here evolved the First Americans, created on the North American continent, not "migrants" or "immigrants" from Asia. For Szathmáry and her disciples Burke and Bourgeon, this model has important political implications for Native Americans by eliminating a migration theory that "offends indigenous Americans by discounting their origin narratives and land rights."



In an exciting push forward, in early 2017 Lauriane Bourgeon of Université de Montréal published new evidence from the Bluefish Caves in the territory of the Vuntut Gwitchin First Nation, in northern Yukon, that confirms Szathmáry's model. Humans, she has discovered, occupied this site as early as 24,000 CALYBP. This means that humans arrived on this continent, in eastern Beringia, far earlier than previously believed, certainly allowing enough time to acquire a unique genetic identity before proceeding south. The Beringian Standstill hypothesis just received a strong pillar of support.



FROM LAURIANE BOURGEON/*PLOS ONE*

Undertaking a momentous task

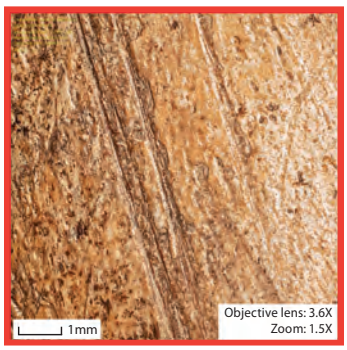
Bourgeon, who has a great interest in the peopling of America and has worked extensively in Alaska and Yukon Territory, admits to originally adhering to the idea that humans first arrived only 14,000 years ago, but has since switched sides. This change in heart came after her supervisor, Ariane Burke of Université de Montréal and the Hominin Dispersals Research Group, recommended that she study a site that Burke had worked on in the 1980s in the Old Crow region of western Canada. This site, named Bluefish Caves, comprises three caves, which were excavated from 1977 to 1987 under the leadership of Jacques Cinq-Mars of the Archaeological Survey of Canada and analyzed by researchers at the then Museum of Civilisation and the Museum of Nature. The site had previously yielded radiocarbon dates on bone indicating that it was possibly as old as 24,000 years ago.

At that time the earliest sites of human occupation in western Beringia, on the Asian mainland, dated to 32,000 CALYBP, while the earliest accepted dates in eastern Beringia, on the North American continent, were about 14,000 CALYBP. The 18,000-year interval was completely barren of data indicating how far migrants had advanced and when they crossed the Beringian Land Bridge from Siberia into current-day Alaska. Burke urged Bourgeon to undertake a taphonomic analysis of the assemblages for her doctoral research.

In the course of her research, Bourgeon would spend three years examining over 36,000 bone fragments from the Bluefish Caves and piecing together a vital segment of that missing history.

From controversial to confirmed

The original analysis of Bluefish Caves bones in the 1970s and 1980s yielded calibrated radiocarbon dates around 25,000 CALYBP and 30,000 CALYBP, a highly controversial age because it pushed back human occupation in eastern Beringia to before the Last Glacial Maximum, about 18,000–24,000 CALYBP, which ran counter to the model for the peopling of the Americas that prevailed at the time. Moreover, no other local sites were found that corroborated this timeframe. Skeptics challenged the integrity of the stratigraphy. "Bluefish Caves was particularly interesting, and very controversial, because of the old dates of human presence at the site," explains Bourgeon. "So it was



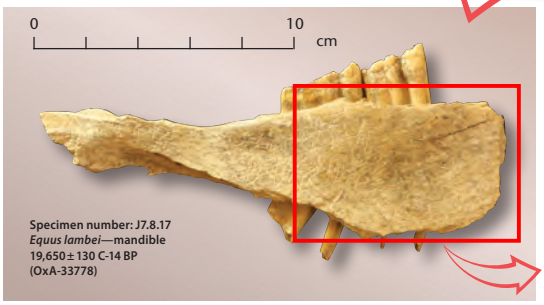
One of the six cutmarked bones sent to the Oxford Radiocarbon–Accelerator Unit, this caribou coxal bone from Cave II shows many parallel cutmarks most likely due to filleting.

essential to have a full and rigorous reanalysis of the faunal remains." She therefore began meticulously reexamining the large collection of faunal remains from Caves I and II to assess the site and gauge its potential importance. Significant items of the examined faunal remains are currently housed at the Canadian Museum of History in Gatineau, Quebec.

Bourgeon, herself originally skeptical of the theorized pre-LGM movement into eastern Beringia, scrupulously checked and rechecked every bone fragment to detect evidence for human modifications, admittedly expecting to prove the theory wrong. In her painstaking analysis, she eliminated all bones modified by natural processes or animals. Having started with 36,000 mammal bones, on completing her analysis of the bone assemblage Bourgeon had found 15 bones that bore unmistakable cutmarks, and another 20 with probable evidence for cultural modification. She sent 6 of the former to Thomas Higham of the Oxford Radiocarbon-Accelerator Unit of the University of Oxford for Accelerator Mass Spectrometry dating.

She found herself seized by the excitement surrounding the Bluefish Caves when Higham reported the results of his AMS dating: calibrated dates ranging from 12,000 to 24,000 CALYBP, which are consistent with the dates obtained by Cinq-Mars when he excavated the Bluefish Caves more than 30 years ago. This suite of dates proves that humans had already crossed the Bering Land Bridge and settled in eastern Beringia during the LGM.

Burke recalls that when she suggested Bourgeon analyze the bone assemblage at Bluefish Caves, she found her skeptical—"but very excited when the results came in!"



FROM LAURIANE BOURGEON/*PLOS ONE*

This horse mandible, excavated from 142 cm below datum, was the oldest dated bone that bore evidence of scoring by stone tools. The repetitive, parallel cutmarks located under the third and second molars on the medial side were made when a butcher removed the tongue. By analyzing cutmarks, Bourgeon found evidence for skinning, dismembering, and defleshing horse, caribou, wapiti, bison, and a possible Dall sheep within the Bluefish Caves. Other specimens that date to the end of the Pleistocene include a caribou coxal bone, horse humerus, and caribou metacarpal that all show signs of filleting, as well as a horse metatarsal that possibly reflects the stripping of tendons.

The clue is the shape of the gouge

Examining the faunal bones from Bluefish Caves, Bourgeon found that most alterations were the result of root etching, abrasion, or carnivore gnawing. Her analysis nevertheless paid off when she discovered cutmarks, solid evidence for human occupation, even if only sporadic. By scrutinizing the shape, trajectory, quantity, location, orientation, and internal microstriations of cutmarks on the bones, Bourgeon distinguished marks made by stone tools from those made by natural agents. For example, a V- or √-shaped incision identifies a cut made by a stone tool; a U - or ⊔ -shaped groove, with a wide bottom and parallel walls, is the signature of a carnivore's tooth.

Since the results of Bourgeon's analysis were published in the journal *PLOS ONE* in January 2017, the article has been viewed over 78,000 times. "I got good feedback and I was congratulated by many researchers around the world," she states candidly. "Some archaeologists remain skeptical, however. They are particularly cautious with the interpretations of bone

continued on page 20

ARIANE BURKE

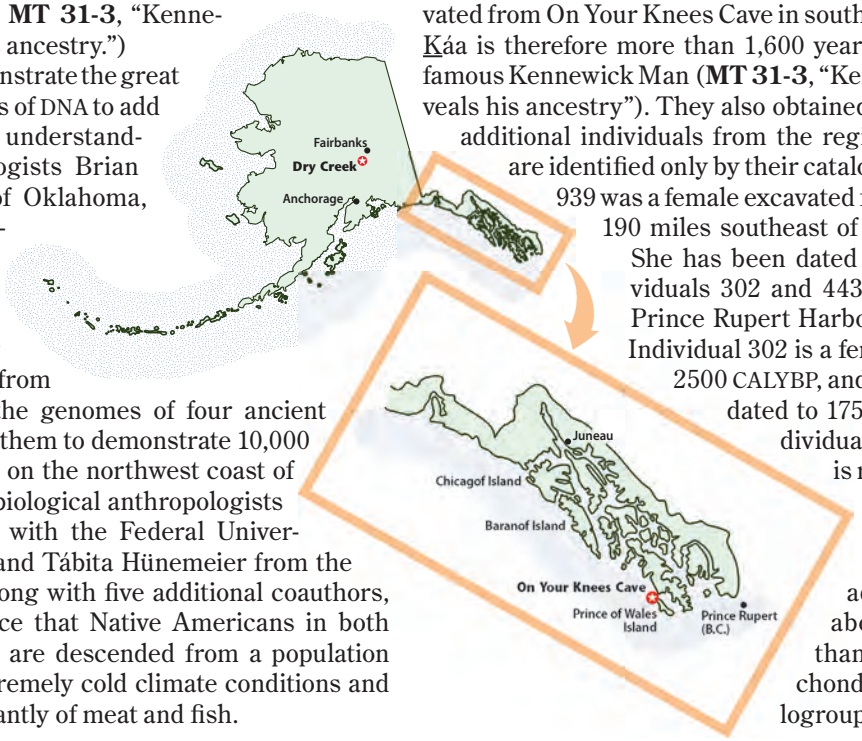
In a laboratory at Université de Montréal, Bourgeon (*foreground*) and Burke monitor the Olympus DSX100 microscope that was used to find and examine cutmarks on bones from Bluefish Caves.

Genetic Insight into the First Americans

An artist's conception of an early occupation at On Your Knees Cave.

STUDIES OF THE DNA of both ancient and modern Native Americans have revolutionized our understanding of the first Americans. From the timing of the initial dispersal of humans into the Americas to their routes of entry and even the extent to which particular Paleoamericans are related to particular modern American Indian and First Nations tribes, all are questions to which DNA is providing answers (**MT 32-2**, "A high-resolution timeline for peopling of the Americas"; **MT 32-1**, "Genetic clues answer fundamental questions about the peopling of the Americas"; **MT 31-3**, "Kennewick Man's DNA reveals his ancestry.")

Two recent studies demonstrate the great potential for future analyses of DNA to add even more clarity to our understanding. Biological anthropologists Brian Kemp at the University of Oklahoma, Michael DeGiorgio at Pennsylvania State University, and Ripan Malhi from the University of Illinois at Urbana–Champaign, along with a team of 15 coauthors from six countries, recovered the genomes of four ancient Americans, which enabled them to demonstrate 10,000 years of genetic continuity on the northwest coast of North America. Brazilian biological anthropologists Francisco Mauro Salzano with the Federal University of Rio Grande do Sul and Tábita Hünemeier from the University of São Paulo, along with five additional coauthors, discovered genetic evidence that Native Americans in both North and South America are descended from a population biologically adapted to extremely cold climate conditions and a diet composed predominantly of meat and fish.



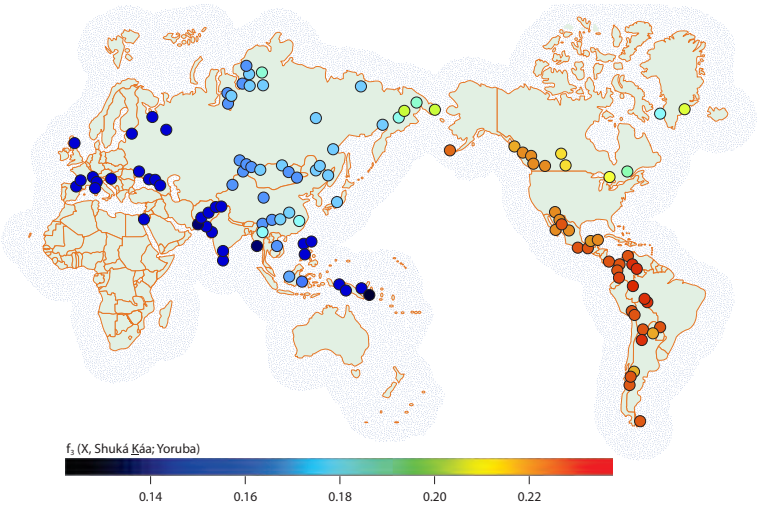
10,000 years of continuity on the Northwest Coast

Kemp, DeGiorgio, Malhi, and their colleagues recovered the genome of Shuká Káa (Tlingit for "Man Ahead of Us"), a 10,300-year-old skeleton of a man whose remains were excavated from On Your Knees Cave in southeastern Alaska. Shuká Káa is therefore more than 1,600 years older than the more famous Kennewick Man (**MT 31-3**, "Kennewick Man's DNA reveals his ancestry"). They also obtained the genomes of three additional individuals from the region. These individuals are identified only by their catalog numbers. Individual 939 was a female excavated from Lucy Island about 190 miles southeast of On Your Knees Cave. She has been dated to 6075 CALYBP. Individuals 302 and 443 were excavated from Prince Rupert Harbor, east of Lucy Island. Individual 302 is a female who was dated to 2500 CALYBP, and 443 is a male who was dated to 1750 CALYBP. A fourth individual, catalog number 938, is referenced in the paper as having been dated to 5675 CALYBP, but the paper gives little additional information about the person other than identifying its mitochondrial DNA (mtDNA) haplogroup, or its branch on the

human family tree. Using the genetic data obtained from Shuká Kää and these other ancient First Nations people, Kemp, DeGiorgio, Malhi, and their team set out to see whether the people of this region showed genetic continuity going all the way back to Shuká Kää.

Shuká Kää's mtDNA indicates he is a member of the D4h3a haplogroup, the same branch of the human family tree as the more ancient Anzick child (**MT 30-2,** "We are all one: Anzick children reburied"). Individual 939 also belongs to the same haplogroup. Kemp, DeGiorgio, Malhi, and their coauthors observe that the D4h3a haplogroup "is virtually absent in northern North America." In contrast, the two individuals excavated from Prince Rupert Harbour and individual 938 all belong to the A2 haplogroup, which Kemp, DeGiorgio, Malhi, and their colleagues identify as "the most commonly reported mitochondrial haplogroup of native North America."

Does this apparent change from older remains belonging to the D4h3a haplogroup to younger remains belonging to the A2 haplogroup signal a significant genetic discontinuity, perhaps indicating a later migration of American Indians from another region, sometime in the past? That's one possible explanation of these data, but the fact that 5,675-year-old individual 938 belonged to the A2 haplogroup demonstrates that this lineage also has ancient roots. It's important to remember that our sample of ancient Americans whose remains have yielded DNA of any kind is small; and that mtDNA is only a small part of the genome. By looking at the nuclear DNA we can get a much clearer picture of population history.



Heat map graphically depicts the outgroup f_3 statistics, which estimates the amount of shared genetic drift between Shuká Kää and 156 contemporary populations since diverging from the African Yoruban population.

FROM LINDO ET AL. PNAS, APRIL 18, 2017, VOL. 114, NO. 16

The full genome analysis of four of the most ancient individuals from the Northwest Coast, Shuká Kää, 939, 443, and 302, shows that they all "display greater affinity with Native American groups than with other worldwide populations." Moreover, 939, 443, and 302 "tend to share greater affinity with [contemporary] Northwest Coast groups." Shuká Kää, however, like Anzick, appears to show "closer affinity to groups farther south."

The principal conclusion of Kemp, DeGiorgio, Malhi, and their colleagues is that their data and analyses "support a shared ancestry for the indigenous peoples of the Northwest Coast dating back to at least ~10,300 cal y B.P." This obviously includes Shuká Kää, in spite of his differing mtDNA haplogroup. This is because his nuclear DNA revealed a close relationship with 302 and 443 and those two individuals are part of a lineage with a close relationship to the contemporary Tsmishian. Therefore, Shuká Kää "was part of a population closely related to the ancestors that gave rise to the current populations of the northern Northwest Coast."

SCOTT AREMAN

Rosita Kaaháni Worl, president of Sealaska Heritage.

Salzano.

First Nations warmly welcome scientific inquiry

One important aspect of this research is the inclusion of First Nations perspectives. In contrast to the bitter acrimony that characterized the interactions between scientists and American Indians in the case of Kennewick Man (**MT 19-2,** "Kennewick Man decision upheld by Court of Appeals"), "the interactions between scientists and indigenous community members associated with this study were and continue to be respectful." Rosita Worl, a coauthor of the study and President of Sealaska Heritage, told the *Alaska Daily News* back in 2008 that "when this 10,300-year-old person was found on

Prince of Wales, the way it was interpreted was that we had one of our ancestors offering himself to give us knowledge." The final paragraph of the paper by Kemp, DeGiorgio, Malhi, Worl, and their colleagues observes that the "collaborative approach of this study shows an example of how indigenous community members and scientific researchers can work together in a positive and mutually beneficial way." Hopefully, this study will serve as a model for future collaborative projects.

Malhi.

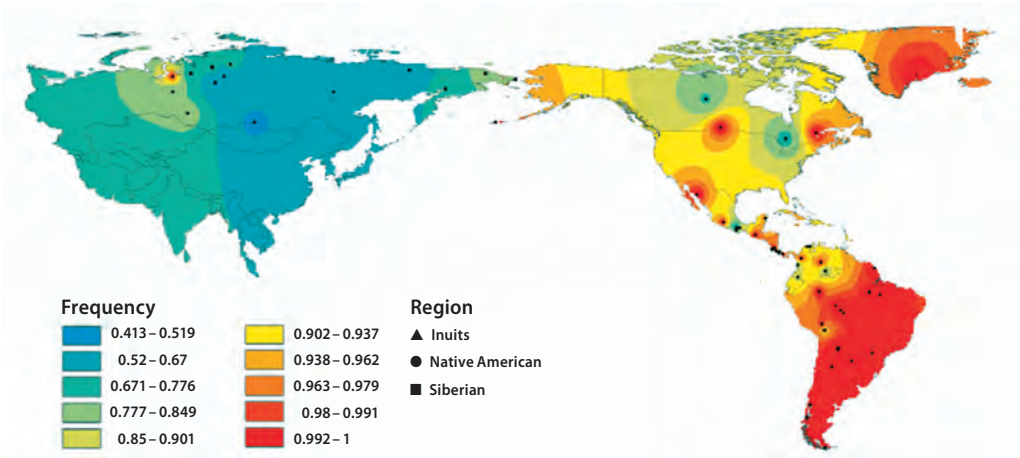
Genetic signature of natural selection in First Americans

Salzano, Hünemeier, and their international team determined that fatty acid desaturases (FADS) genes, which are present in Inuit populations and may be "due to adaptation to the cold Greenland Arctic climate and to a protein-rich diet," aren't restricted to the Arctic, but are instead "broadly observed throughout the Americas." Since those genes would confer no obvious benefit to populations in warmer climates with a greater variety of available food resources, Salzano, Hünemeier, and their coauthors suggest that their widespread occurrence could be a genetic relict of an "adaptation that took place in the common ancestral population before their entrance into the New World." That's an intuitively plausible notion, but what is the evidence to support the idea?

These FADS genes play a role in metabolizing omega-3 polyunsaturated fatty acids, which are found in such food components as fish oil. The diet of the Greenland Inuit is rich in protein and fatty acids, and therefore ancestral Inuit who possessed these genes would have enjoyed an obvious advantage in getting the most out of their restricted diet and consequently would have been more likely to survive and pass those genes on to their offspring.

As a first step in testing that hypothesis, Salzano, Hünemeier, and their team compared Native Americans with East Asians, Europeans, and Africans to establish whether the relevant FADS genes "had high frequencies in indigenous American populations and low frequencies elsewhere." The team identified a number of single-nucleotide polymorphisms, SNPs, or simply mutations to particular genes, that occurred at high frequencies in indigenous Americans and were "located at, or near, genes related with metabolism." At least one of the SNPs turned out to be at "one of the sites found under positive selection in the Greenlandic Inuit."

All this supported the idea that the presence of these variants in widespread Native American populations was "the result of adaptation to the conditions encountered by the ancestors of the first Americans in Beringia," but to gain further insights, Salzano, Hünemeier, and their colleagues "compared the genotypes of living Native Americans and Inuit to those of four ancient humans": Saqqaq, "a Paleo-Eskimo from Greenland who lived ~4,000 yBP"; Anzick-1, a child of the Clovis culture (**MT 29**-2, "Clovis child answers fundamental questions about the First Americans"); "the Mal'ta boy who lived in Siberia ~24,000 yBP" (**MT 29-2,** "Ancient Siberian boy reveals complex origins of First Americans"), and the "Ust'-Ishim man, who lived in Siberia ~45,000 yBP." That the FADS genes were present in the Anzick child and in both ancient and modern Native American populations, but not in Siberians or the Paleo-Eskimo, is "consistent with a scenario of intense selection during the Beringian standstill" according to Salzano, Hünemeier, and their coauthors. They argue that "after migrants from northeastern Siberia as well as other Asian regions" arrived in Beringia, people possessing the FADS genes had a strong advantage over those who did not. So for the next several thousand years, while these groups were isolated in Beringia, these genes spread throughout the population. As



The geographic distribution of the putatively selected FADS haplotype demonstrates the role of natural selection in Native American populations.

Hünemeier.

PNAS, FEBRUARY 28, 2017, VOL. 114, NO. 9, 2197

a result, 95% of their modern descendants have the FADS genes, in spite of the fact that many now live in environments in which those genes no longer give them an advantage.

Salzano, Hünemeier, and their coauthors suggest that the fact that contemporary Inuit and Aleut lack the FADS genes, even though they, too, are descended from the ancient Beringians, is due to a "subsequent, and more recent, stream of Asian gene flow" that introduced other genes, which ultimately replaced the FADS genes in these groups. The Greenland Inuit, however, do have the FADS genes, which they inherited from their ancestors—the First Americans.

E. JAMES DIXON

Excavating the main entrance to On Your Knees Cave, 2002.

TERRY FIFIELD, COURTESY OF SEALASKA HERITAGE INSTITUTE

The box containing Shuká Káa's remains, interred at an undisclosed location on Prince of Wales Island.

A genetic trait that spans the Americas

These data demonstrate that FADS genes are not restricted to Arctic populations in North America. Indeed, Salzano, Hünemeier, and their colleagues determined that they occur in "all 53 Native American populations" they studied, "including a strong signal in Amazonian populations that are extremely different from the Inuit regarding culture, environment, and diet." They conclude therefore, that the data are best explained as a result of "a single and very strong adaptive event that occurred in Beringia, before the range expansion of the ancestors of the first Americans within the American continent and Greenland." Based on the evident advantages conferred by the FADS genes, they suggest this "adaptive event" was related to "the metabolic adaptations to diet and cold weather required to subsist during glacial and periglacial conditions that existed during the Beringian standstill."

The idea that adaptations reflecting the conditions faced by the first Americans might be retained by their descendants generations later, in spite of the fact that those conditions changed substantially over the centuries and as groups expanded throughout a varied hemisphere, isn't a far-fetched notion. It finds additional support in the work of Benjamin Auerbach, who found that body shape in early-Holocene Paleoamericans, including Kennewick Man and Spirit Cave Man, had relatively wide bodies physiologically adapted to cold environments even though these individuals were no longer living in exceptionally cold climates (**MT 28-3**, "Early skeletons point to a single source population for the First Americans").

The contributions of Kemp, DeGiorgio, and Malhi's team and Salzano and Hünemeier's team show what insights genetic data can provide to our understanding of the first Americans as well as the varied histories of their descendants. Kemp, DeGiorgio, Malhi and their colleagues show how, at least in some regions, a strong genetic relationship may exist between the most ancient and most recent Native American populations. Salzano, Hünemeier, and their colleagues show that adaptations acquired by the First Americans can be retained as a sort of genetic fossil by some of their descendants. MT

–Brad Lepper

How to contact the principals of this article:

Brian Kemp
Department of Anthropology
University of Oklahoma
e-mail: bmkemp@ou.edu

Ripan Malhi
Carl R. Woese Institute for Genomic Biology
University of Illinois at Urbana-Champaign
e-mail: malhi@illinois.edu

Francisco Mauro Salzano
Department of Genetics
Federal University of Rio Grande do Sul
e-mail: francisco.salzano@ufrgs.br

Tábita Hünemeier
Department of Genetics and Biological Evolution
University of São Paulo
e-mail: hunemeier@usp.br

Suggested Readings

Amorim, C. E. G., K. Nunes, D. Meyer, D. Comas, M. C. Bortolini, F. M. Salzano, and T. Hünemeier 2017 Genetic signature of natural selection in first Americans. *Proceedings of the National Academy of Sciences* 114 (9):2195–99.

Lindo, J., A. Achilli, U. A. Perego, D. Archer, C. Valdiosera, B. Petzelt, J. Mitchell, R. Worl, E. J. Dixon, T. E. Fifield, M. Rasmussen, E. Willerslev, J. S. Cybulski, B. M. Kemp, M. DeGiorgio, and R. S. Malhi 2017 Ancient individuals from the North American Northwest Coast reveal 10,000 years of regional genetic continuity. *Proceedings of the National Academy of Sciences* 114 (16):4093–98.

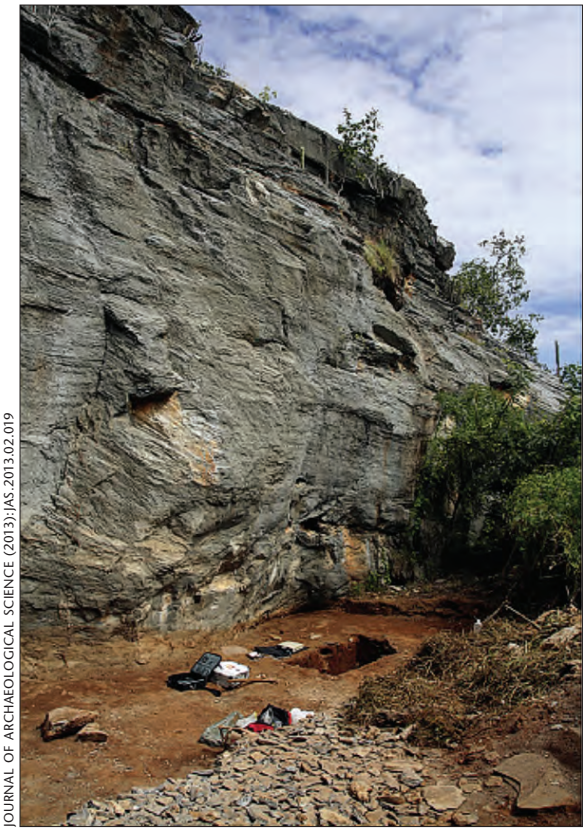
BRAZIL

LEAFING THROUGH PREHISTORY

Part 2: Consolidating the gains

IF YOU SIFT through the archaeological literature from recent decades, prepare to be stunned by waves of criticism that have assailed the Boqueirão da Pedra Furada site of northeast Brazil, mainly coming from the North American camp. Nonetheless Niède Guidon, the site's lead investigator, has persisted. At home on the grounds of a museum she founded to focus on the discoveries in Serra da Capivara, she believes that humans reached these regions even earlier than she has claimed, and that some immigrants might have come, not from Asia, but by boat from Africa. To carry on her decades of research, Guidon mobilized a Franco-Brazilian team of researchers that set out to locate other sites in the region and silence the opposition for good.

Pedra Furada comprises two sites separated by tens of meters. Boqueirão da Pedra Furada was dug by Guidon in the 1970s and '80s. The other, named Vale da Pedra Furada, was first dug by Eric Boëda's team in 2010 and is currently under study. His team is also currently reinvestigating Boqueirão da Pedra Furada, but to date no article has been published on that study.



JOURNAL OF ARCHAEOLOGICAL SCIENCE (2013):JAS.2013.02.019

Staving off the critics

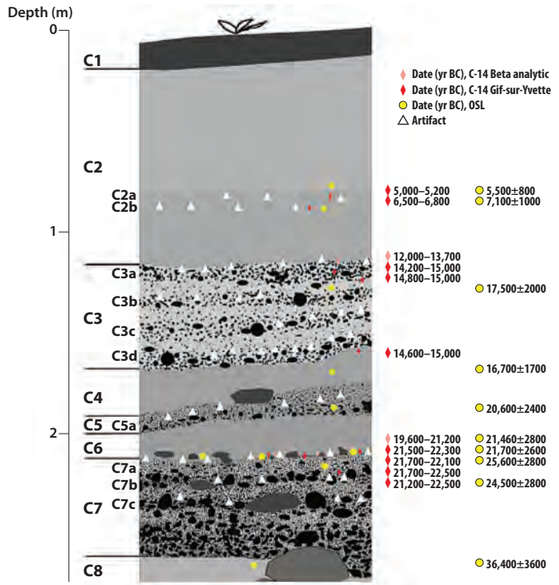
While excavating beneath the rock art at Boqueirão da Pedra Furada, Guidon discovered apparent stone tools, but critics argue that these alleged artifacts could have been created by natural agents—the result of thermal cracking, rock fall from overhead, or perhaps crafted by monkeys. Brazilian archaeologist Annelise da Silva Neves dismisses the argument that advocates thermal cracking. She explains that "pieces that break apart from [natural] heating and cooling will be very concave or convex, and the other part won't have an orientation mark where it was broken. When it's man-made it's different. You can almost always find exactly where a shard was taken from."

To avoid the kind of speculation encountered at Pedra Furada, that rocks fell from the cliff face and shattered on impact with other rocks, thereby creating geofacts masquerading as artifacts, Guidon's team next deliberately chose a site distant from cliffs. Eric Boëda, Professor of Anthropology at the University of Paris and a specialist in prehistoric lithic technology, counters the claim that monkeys performed crude flintknapping. Boëda has worked in Brazil since 2008; before that, he had worked primarily in China. Guidon asked him to help excavate Pedra Furada. He recalls studying the artifacts at Pedra Furada for the first time and being convinced of their human origin. "The difference between things made by humans and monkeys is very simple," he tells us. "For humans, the first thing is to produce tools.

The Toca da Tira Peia Rockshelter during the 2008 excavations. The calcareous rockshelter is oriented approximately east–west.

We found a lot of different cutting edges that cannot be produced by nature or by monkeys." He says it's easy to recognize human modifications.

More than 307 lithic artifacts have been recovered at Pedra Furada; 165 from archaeological horizons in layer C3, 34 from layer C4, and 108 from horizons in layer C7. The assemblages from different layers are fairly similar in lithic technology. The raw material used is quartz cobbles, although quartzite cobbles are also abundant. The chronological framework places the upper unit in the Middle Holocene, the lower unit in the Last Pleniglacial 26,000–15,000 years ago. Horizon C7, the richest in terms of recovered lithic artifacts, has been consistently dated, through combined OSL and radiocarbon dating techniques, to 23,000 years ago.

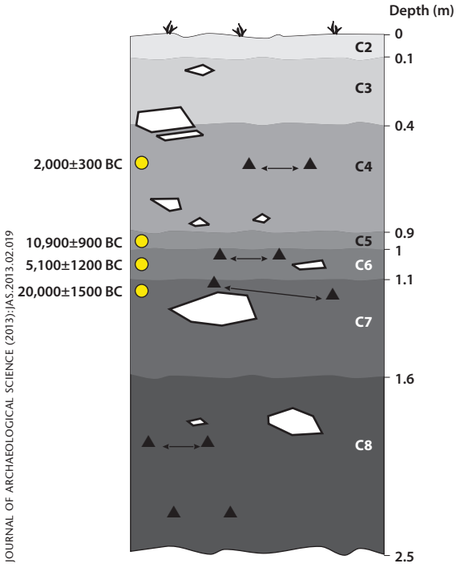


Archaeological sequence and dating results at Vale da Pedra Furada.

AFTER ANTIQUITY PUBLICATIONS LTD. ANTIQUITY 88 (2014): 927–55

Boëda agrees with Guidon that such early dates may have been possible but that more research is needed. The team's initial mission was to find a site where "human occupation was not in doubt" and thereby avoid the kind of criticism Guidon faced at Pedra Furada. Another investigator, Christelle Lahaye, physicist and Associate Professor of Archaeology at Bordeaux Montaigne University, explains that they chose a site in another part of the Serra Capivara park, Toca da Tira Peia, because the stratigraphy and rock are different from Pedra Furada. Moving away from the cliffs greatly allays any suspicion that potential artifacts are geofacts because they aren't associated with natural rock fall.

"That was a strategic move on the part of the researchers," says Ruth Gruhn, Professor Emerita of Anthropology at University of Alberta. "They found there was a limestone bluff not too far from Pedra Furada, which is in sandstone and has an Oligocene-age gravel conglomerate right over the site from which people think these rocks were derived. But Tira Peia is in a limestone block, and there's no gravel conglomerate over the site from which pebbles could have been derived. The fill at Tira Peia is of colluvial sand and silt, and the artifacts are exotic quartz and quartzite not derived from the immediate vicinity and occur in four definite occupation levels, and there are refits within these levels [pieces that refit on each other that indicate they haven't been disturbed]. So that's a hard one to dispute."



JOURNAL OF ARCHAEOLOGICAL SCIENCE (2013):JAS.2013.02.019

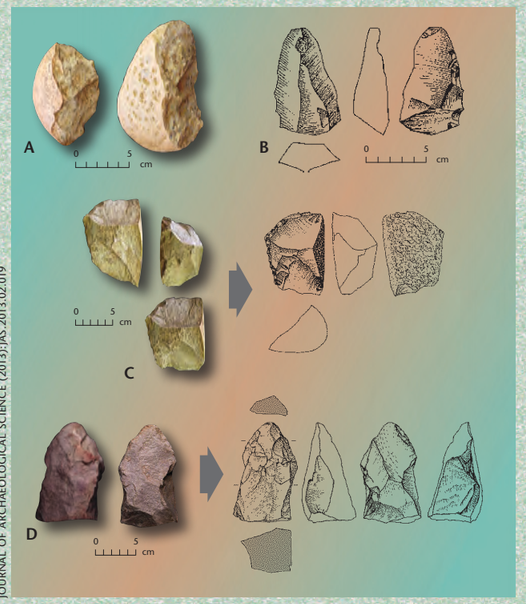
Archaeological sequence and OSL dating results at the Toca da Tira Peia Rockshelter. The arrows identify refitted toolstone fragments.

A fresh start at Toca da Tira Peia

"Tira Peia" means "throw the snake out!" The site was given its name in 2008 after a small snake was discovered one morning lying in the first excavation hole. Located in Coronel José Dias next to the Serra da Capivara National Park in the state of Piauí, the site seemed a "safe" choice. First, there are no pebbles in the sediment, so researchers deduced the pebbles must have been brought from a remote source and knapped by humans. Second, the colluvial sediments were suitable for OSL dating.

Lahaye's task was to date the quartz grains in the sediments that constitute the archaeological levels. (Lahaye was unable to perform radiocarbon dating owing to a paucity of organic material, precisely the same obstacle encountered by the CSFA team at the Friedkin site in Texas as described in part 1 of this series). As a confidence measure, Lahaye "wanted to date both Toca da Tira Peia (no charcoals preserved) and Vale da Pedra Furada (contains charcoal): the chronological results in Vale da Pedra Furada are very coherent between OSL and C-14, so there is no reason to suspect any problem with OSL dates of Toca da Tira Peia." Nevertheless, when the team presented their dates to other

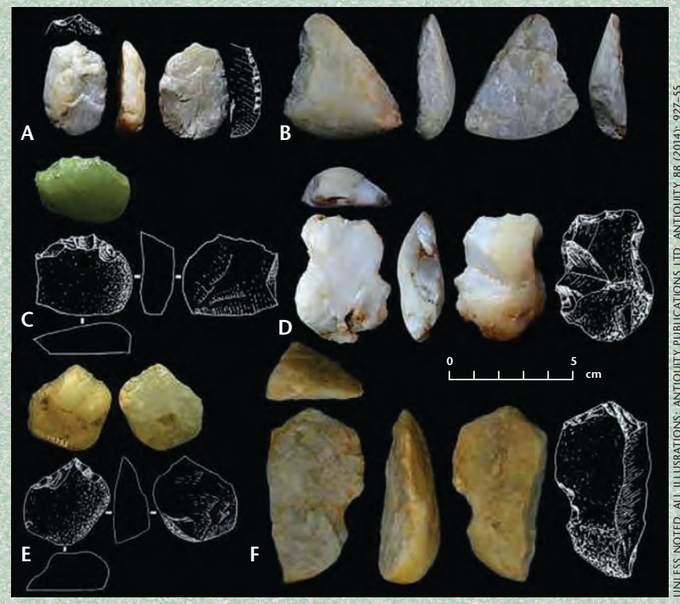
PEDRA FURADA, THE EVIDENCE



JOURNAL OF ARCHAEOLOGICAL SCIENCE (2013):JAS.2013.02.019

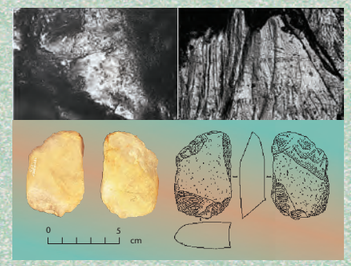
Lithic artifacts from the Toca da Tira Peia Rockshelter: A, worked quartzite pebbles, layer C4; B, denticulate tool on siliceous limestone flake, retouched on lower face, layer C6a; C, tool on quartzite pebble with convergent retouched edges, layer C6a; bifacially shaped tool on quartzite pebble, layer C7a.

Lithic tools from Vale da Pedra Furada: A, inverse retouch and bec, layer 7a; B, denticulate on Siret flake, layer 3d; C, denticulates on Siret flakes, layer 7a; D, multi-notches on split, layer 5a; E, symmetric convergent pieces, layer 3d; F, endscraper. layer 3d.

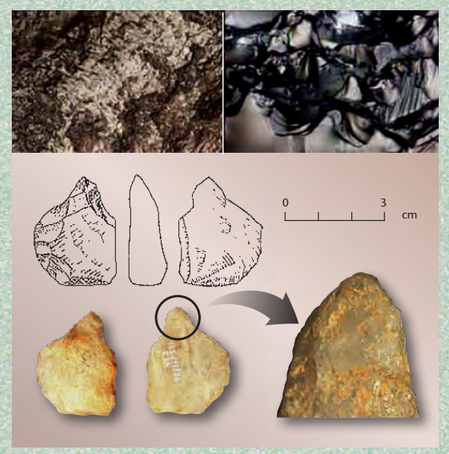


UNLESS NOTED, ALL ILLUSTRATIONS: ANTIQUITY PUBLICATIONS LTD. ANTIQUITY 88 (2014): 927–55

Worked half-pebble with double-beveled transverse edge, layer C3b, Vale da Pedra Furada.



Tool 198057 from layer C7b, Vale da Pedra Furada. Microphotos of use-wear analysis show evidence for butchering activity.



Tool 191306 from layer C3d, Vale da Pedra Furada, with microphotos of use-wear. See story for analysis by Boëda.

archaeologists, they were met with skepticism. "If you have one site you can have doubt," Lahaye tells us. Then she treats us to a rhetorical argument: "Maybe something strange is happening. Maybe something went wrong. But when you have a second site, a third, a fourth, it's more convincing. I would like some people to say, 'I think it's not possible, so I want to dig another part of the site and do another geomorphological study.' Okay, go on, make it, but don't just say it's not possible. All these people on the team are making this kind of archaeological work in other parts of the world, so why should they forget how to make good dates and chronology in Brazil?" she asks.

To better contend with critics, Lahaye and Boëda started attending conferences together because they can speak with authority in their areas of expertise: Lahaye handles questions regarding dating techniques, Boëda explains matters relating to lithics, taphonomic processes, and use-wear studies.

Unquestionable artifacts by the score

Boëda discovered 120 knapped artifacts at the Toca da Tira Peia site. "We have a lot of different cutting edges that cannot be produced by nature or monkeys," he says confidently. "It's easy to recognize the human modification." To his practiced eye the diversity of working edges bears witness to a multifarious range of activities, further confirmed by use-wear and techno-functional analyses. Examples of function-based varieties are tools made for working wood, for working hard non-wood materials like bone and antler, and for working hide.

Southern zone of Vale da Pedra Furada showing upper unit C1–C2 and lower unit C3–C8 (C8 lies directly below C7; its base hasn't yet been reached).

ANTIQUITY PUBLICATIONS LTD. ANTIQUITY 88 (2014): 927–55

Consider, for example, tool 191306 from layer C3d, Vale da Pedra Furada (page 11, lower right). Says Boëda, "This tool has a pointed apical part with rounding and bidirectional micro-fractures, indicating rotational and bidirectional movements. The convergent edges have strong scalar splintering, produced by the removal of microflakes at different times during contact with the hard material. Only the dorsal crest of the tool shows macroscopic rounding, on which the presence of shiny micropolish, compact and with crackling, was noted. These characteristics were obtained on micropolishes obtained experimentally when working hard animal materials (bone and/or antler)."

That toolstone was obtained from remote sources further testifies to the human element. He assures us that "you must go at least 20 km to get these materials. We're seeing complex behavior here. Humans went to great lengths to obtain certain kinds of material."

Boëda believes that North American archaeologists remain skeptical of these early dates owing, in large part, to their lack of expertise in lithics. "The researchers are not specialists of lithic artifacts," he argues. "They are generalists." Regarding quartz tools found at Toca da Tira Peia, Boëda's team discovered that they were selected principally for the quality of the quartz (the most uniform was selected), and also with an eye to morphology, volume, and other criteria. Boëda emphasizes that whereas nature produces objects randomly, humans pursue a recurrent technological approach based on tool types. Painstaking attention to detail demands time-consuming selection of toolstone and knowing where to find sources of high-quality toolstone in a dense environment, rather than trusting to luck to happen upon suitable material.

Because Boëda has worked across Asia and Europe in addition to the Americas, he has a broad perspective on the prehistoric lithics industry and can make informed judgments based on comparisons. The tool industry encountered at Toca da Tira Peia and similar sites is primitive compared with that practiced by more advanced cultures—an educator might describe early Brazilian toolmakers as lower on the learning curve. Special training is therefore required to recognize and analyze their artifacts. "When you're in front of a Clovis point, it's clear for you," Boëda explains. "You don't ask if it's human or nonhuman. You have the memory of these types of tools, but in South America you don't have these points. At Capivara, when you're in front of artifacts, or when you're in South Korea, you don't have the memory of these tools when you're before them. So when you're not a specialist, it's easy to dismiss them as not being human tools."

A pronounced biface bias exists among North American lithics analysts, Gruhn suggests, because here projectile points (arrowheads, spear points, etc.) dominate. Sites in northeast Brazil, on the other hand, yield mainly crude flakes and cores, but no projectile points. Boëda likens the technology of South

Korea 20,000–50,000 years ago to that in Capivara because toolmakers on opposite sides of the globe had similar raw materials to work with. "When you've got a certain material in a certain quantity, you see convergence," he reasons. "You start seeing the same tools. You don't have a lot of solutions, a lot of ways to make the tools. It's different with the block, where you're more free to produce something. With the pebble, you have the morphology of the pebble, for example. You're more limited to the kinds of things you can make when you have material with a set morphology." The lithics industry of East Asia, where quartz cobbles, both knapped and shaped, formed the basis for toolmaking across a million years, shows us that technical decisions made in sites like Tira Peia are by no means unique, but instead figure prominently in the universal history of lithics technology.

Sitio do Meio

The Sitio do Meio Rockshelter boasts secure Pleistocene dates and, to Boëda's eye, unmistakable artifacts—perhaps better preserved because of the absence of waterfalls here. At least 98 stone tools have been recovered that appear to be older than 12,500 years. The rockshelter contains a 6-m-deep overhang that protects walls covered with paintings. In 1993

ERIC BOËDA

Excavation at the Vale du Pedra 2.

Guidon led an excavation below the overhang and exposed a 4-m-thick stratigraphic sequence; her excavation reached a stratum dating to 14,000 CALYBP before being halted by a heavy rockfall. After clearing a small area of the rockfall, Boëda continued excavating and reached older sediments containing lithic artifacts and charcoal, which dated to 29,000 CALYBP (before the Last Glacial Maximum). The most impressive discovery he made here was a rock superstructure along the wall that cannot be attributed to natural deposition; it could be evidence for the first human spatial organization in this region.

The internal area of the rockshelter formed by two orthogonally oriented blocks is littered with small cobbles of a different material from the rock that composes the walls. Abundant charcoal fragments are also distributed within the two distinct stratigraphic units. The 2012 excavation yielded a large number of artifacts in a limited area, dominated by tools with convergent edges similar to those found at Pedra Furada. The Pleistocene age obtained here, and in Pedra Furada and Tira Peia as well, dates to the last Pleniglacial.

The fluid nature of knowledge

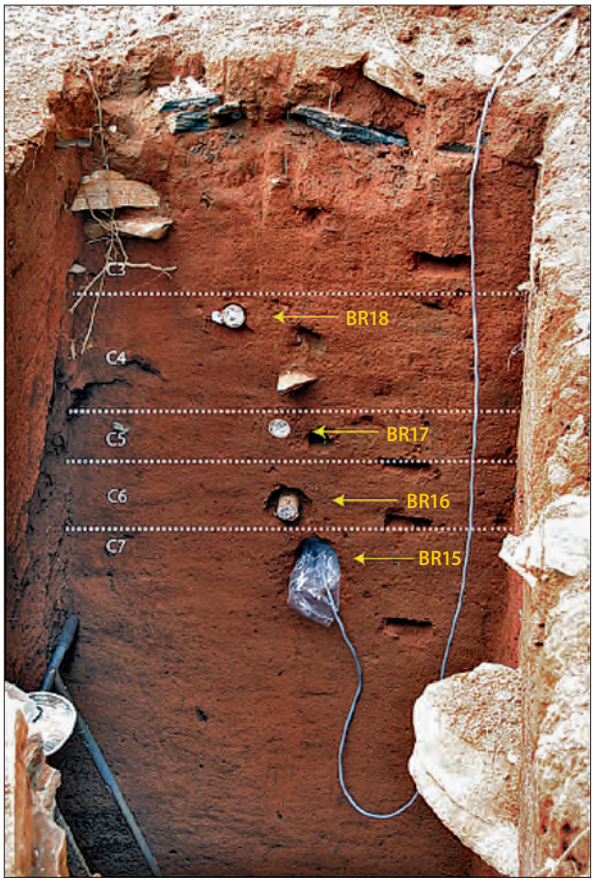
Given Lahaye's dates and Boëda's artifacts recovered at Tira Peia and Sitio do Meio, it's difficult to dispute the fact that several sites in Brazil date earlier than 20,000 years ago. The evidence demands that we admit the possibility that people arrived before the Last Glacial Maximum. Ruth Gruhn is even more insistent: "To add to the public cauldron is the fact that Tom Dillehay, on the other side of South America, went back to the Monte Verde locality to explore an occupation level (Monte Verde I) for which he had a date of 35,000. He dug exploratory pits all over the floodplain of the creek, and he discovered small sporadic occupations, with limited material over a limited area in each case, and these date back to about 19,000 years ago, right up to the time of the well-established Monte Verde II settlement with all the perishables. So it's getting pretty awkward for North American archaeologists to deal with this. It requires a change in thinking. North American archaeologists are only tentatively accepting the idea that people came in about 15,000 years ago, and uh, wow, the entry may be twice as old!"

Although the Clovis-First model is deeply embedded in the minds of archaeologists, many now accept that there were people in the Americas before Clovis. We know that the Western Stemmed Point Tradition of the Great Basin and Pacific Coast is at least contemporaneous with Clovis, and other sites that refute the Clovis-First model continue to surface in North America. The Peopling of the Americas model is experiencing a period of violent flux, and North American archaeologists must be prepared to discard a shelf-worn model that once dominated mainstream thought.

Hobbled by mind set and a patronizing attitude

With the benefit of half a century of intimate knowledge of archaeology practiced in North and Latin America, Ruth Gruhn has some harsh words for North American scientists. "I hate to say it," she says, "but there has been some skepticism about the competence of South American colleagues, which is com-

pletely out of sight right now because those guys down there practice state-of-the-art archaeology. The Argentines have been well known for great archaeology, and the Brazilians and Colombians are right up there and contributing, and so that scene has got to change. People have got to accept that those guys are our colleagues down there. And North American archaeologists are even skeptical about their European colleagues at times." She doubts that critics have read the 1993 dissertation of Fabio Parenti, an Italian academic, whose thesis was published in French by the Sorbonne. His doctoral studies focused on the Prehistoric archaeology of Pedra Furada under Guidon's supervision. Today he's a visiting professor of Prehistory at the University of São Paulo—and, in addition to his mother tongue, he speaks English, French, Portuguese, and Spanish fluently. "Not many North American archaeologists read French, to say nothing of Spanish," Gruhn observes, "so one problem is that they cannot or will not read the South American or European archaeological literature."



JOURNAL OF ARCHAEOLOGICAL SCIENCE (2013):JAS.2013.02.019

Sampling strategy at the Toca da Tira Peia Rockshelter, showing location of OSL samples and in situ gamma spectrometer measurements.

She notes that however important a research legacy is for many academics, its collected wisdom is bound to change, given the fluid nature of knowledge. An academic goes into the field expecting to contribute to knowledge and believing that it will last, but "as far as theories and ideas and models go, of course those are bound to change. I'd love to be around a hundred years from now," Gruhn fantasizes, "to see what people think about the initial settlement of the Americas. It might be nothing like what we think now."

Looking forward

If the principals of this series were given a magic wand, what would they wish for in years to come? Says Lahaye, "We need to find something new at these sites to really convince people they're not geofacts. We need to find some human beings. We have dates—I say dates first because it's my area of expertise—and we have artifacts, archaeological studies, a lot of things. But we don't have bones, we don't have human beings. Some colleagues won't believe it until we have this. The problem is that the major part of the sites we're studying don't preserve bone, so archaeologists may have to move a little to find places with sediments to try to make studies to see if they find or don't find human beings."

For her part, Gruhn hopes that future anthropologists will construct a more realistic picture of the time and routes of entry to help us understand how people coming into this new world adapted. This will require reconstructing paleoenvironments—what the world was like when people moved into a particular territory and the various ways in which they adapted to this new landscape. "That's one major difference between North and South America," Gruhn notes, "the amount of cultural diversity that one saw even in the earliest times of South America. Whereas we've always been saddled in North America with Clovis, big-game hunters, and that sort of thing—more monotone—one thing I've noticed about archaeologists in South America, Colombia particularly, is

continued on page 20

L. Adrien Hannus, professor of anthropology, holds the David B. Jones Distinguished Chair in Anthropology and is director of the Archeology Laboratory at Augustana University in Sioux Falls, South Dakota.

An Early Discovery Leads to a Lifetime Passion

Nora Flegenheimer

Flegenheimer excavating at the Cerro El Sombrero site, 2016.

ALL PHOTOS: NORA FLEGENHEIMER

FATE SOMETIMES seems to find us in the right place at the right time. The serendipitous moment came for Argentinian archaeologist Nora Flegenheimer when, early in her career, she discovered the first Fishtail point in stratigraphic context in Argentina. She worked in conjunction with Quaternary geologist Marcelo Zárate, who deciphered geological deposits and processes. "He was my age and we understood each other and worked together for years," she says. "We still are very, very good friends."

Flegenheimer shares the credit for discovering unexpected evidence for early occupations in the nearly unexplored Pampas with Argentinian archaeologist Gustavo Politis. They worked at sites separated by 200 km, Flegenheimer in the Tandilia Range, Politis on the plains at Arroyo Seco. "It was a fascinating time," says Flegenheimer, "because everything we found was new." And all this occurred before Flegenheimer had sprouted a single gray hair.

A storybook childhood and a daunting education

Who is Nora Flegenheimer? Zárate describes her as "a very good friend and colleague for more than three decades with whom I shared the adventure of exploring the past, understanding our present, and discussing the near future. A talented, hard-working, and devoted researcher, Nora has the touch of delicate and obsessive passion to decipher the Pampean puzzle of the early peopling. She is an excellent teacher, rigorous and meticulous with every detail, and a supreme manufacturer of homemade cookies, tempting cookies indeed I tried several times when working together."

Born in Buenos Aires in 1955 to a radiochemist working in the Argentinian National Atomic Energy Agency and an artistically oriented mother, Flegenheimer traveled with her family to Cambridge and later to Germany, where her schooling imparted a European background. Eventually she sat for her Cambridge exams in Buenos Aires and then went on to study at La Plata.

Later teaming with Professor Cristina Bayón of Universidad Nacional del Sur, Flegenheimer examined in detail social and symbolic aspects of early occupations in South America, a subject that fascinates her and intrigues her students to this day.

"Nora is a great colleague in numerous ways," says Professor of Prehistory Bruce Bradley of the University of Exeter, UK. "She is an exceptional scholar and great with students. She is inspirational, generous, enthusiastic, insightful and perseveres under extraordinarily difficult circumstances. It is because of her support that I made contacts with South American colleagues and am now involved in Paleoamerican research there. I am looking forward to a continuing collaboration with Nora."

Fishtail points abound in the Pampas and northern Patagonia

The Southern Cone of South America, the biogeographical region south of 18 degrees south latitude, embraces a constellation of sites with distinctive features and occupations, of which many predate the North American Clovis culture. The artifact so widespread it could serve as the icon of South American Paleoamericans is the Fishtail, or Fell 1, projectile point. Fishtail points were first discovered in 1938 by Junius Bird at Fell's Cave on the southern tip of the continent, southernmost Patagonia a bit north of Tierra del Fuego (**MT 23-4, 24-1, -2,** "In the footsteps of Junius Bird"), and are well represented at other sites dated 11,500–9000 RCYBP. Fishtail points in the Southern Cone exhibit variations in morphology and toolstone type and

therefore serve as valuable evidence for studying exchange, social identity, and migration routes.

The Fishtail point is the thread that links two noteworthy Argentine sites, Cerro El Sombrero Cima in the Pampas and Cerro Amigo Oeste in Patagonia, worked by Laura Miotti and her team. Both sites yielded many broken Fishtail points and, curiously, the same kinds of artifacts—discoidal stones and small spheres. Moreover, each site sits high atop a butte that dominates the surrounding plains, and each is encircled by a rocky outcrop. In both sites the field of view extends to the horizon, which made them useful for spotting game and for communicating with other people. Profuse numbers of point stems, broken preforms, and trimming flakes suggests they were workshops for retooling lithic artifacts. The common hilltop location and remarkably similar artifacts suggest to Flegenheimer that occupants of these sites, separated by 900 km, shared social values during the Pleistocene-Holocene transition.

Tracing the peopling of South America

Patagonian and Pampean sites in Argentina sheltered hunter-gatherer societies until the Spanish conquest. The date of the initial colonization is being pushed further back with every new discovery. A famous site in the Southern Cone, Monte Verde in Chile, has drawn much attention because it challenges well-established ideas about the timing, settlement patterns, and management of resources during the peopling of the Americas. Discoverer Tom Dillehay of Vanderbilt University cites evidence that dates its occupation to as early as 18,500 CALYBP. Today South American anthropologists recognize about 70 sites older than 9000 RCYBP. Debate swirls over the antiquity of the earliest sites, and some are still not widely accepted.

"There are very strong evidences of First American occupations in South America from 25,000 to 15,000 RCYBP," Flegenheimer tells us. "I do not see these evidences falling into a pattern at the moment, which makes me think that probably the peopling was not so linear or simple as we once thought. Possibly we are seeing dispersed evidence because some groups did not thrive in the new land and were outnumbered by later populations, but I think people who produced Fishtails knew their surroundings well and were integrated in the social and natural landscape." She describes the peopling process as an integral part of a model that proposes an exploratory phase and a colonizing phase, as initially suggested by colleague Luis Borrero. "The model is based on the intensity of land use and expected material culture, and is being widely tested. Other proposals consider peopling not as a process, but rather as a diaspora that created social times and places."

Interdisciplinary research teams in South America integrate the contributions of geologists, palynologists, paleontologists, and archaeologists, who participate in fieldwork and publish jointly. Teams study the relationship of humans to megafauna and the role humans played in megafaunal extinction. It was probably a modest role: Unlike the famed mammoth and bison hunters of North America, Paleoamericans in the Southern Cone rarely sought megafauna as a food source. Guanaco, smaller mammals, and even reptiles were their principal source of food.

Artists among the population

Rock art, as relevant to a study of humans in the Southern Cone as of other hunter-gatherer cultures, is most abundant in central Patagonia. It most likely served as a medium for visually communicating between groups of hunter-gatherers. Less common are examples of portable art and decorated objects. Although no rock art has been assigned to early settlers in the Pampas, Flegenheimer relates that "we think of the discoidal stones with central engravings as representatives of portable art. Also the early occupations I have excavated have fragments of ocher—they were coloring something, but I don't know what."

Just unearthed, what Flegenheimer calls an "atypical fishtail point."

Toolmaking, a thriving industry

As is true of Clovis points over their range, Fishtail points across the expanse of the Southern Cone exhibit considerable variability in morphology. The sequential lithic

technology started from blanks produced in quarries. The manufacturing effort was roughly proportional to the size of the point: Miniature and atypical points had a very low labor investment, compared with greater time and effort required for medium-size and larger points. Flakes of the proper thickness were worked by careful bifacial marginal retouch or bifacial reduction.

Exhausted and broken Fishtail points were commonly discarded on the summits of mesas, such as the workshops at Cerro El Sombrero Cima and Cerro Amigo Oeste. Very few intact points were discarded. Flegenheimer believes this finest product of the toolmaker's art was also imbued with great social, symbolic, and personal significance.

Fishtail points, small spheres, and an engraved discoidal stone from Cerro La China and Cerro El Sombrero.

Choice of toolstone tended toward the exotic

Early occupants of the Pampas preferred translucent and colorful toolstone, which they formed into unifacial tools, bifaces, and scrapers. Although Fishtail points predominated, lanceolate points have been found in early sites like Monte Verde, smaller triangular points in the Argentine and Chilean Puna–grassland ecoregions, and Paiján points in northern Chile and Peru.

Over the past two decades, studies of human occupations in the Argentine Pampas have painted a more complex image of residents of this area. Toolstone from early assemblages was obtained from rocks in the immediate vicinity.

Distribution studies done on the northwestern and Patagonian regions of Argentina, which were home to both hunter-gatherer and agricultural societies, show that both regional circulation and long-distance transport were practiced in these areas. Bifaces and obsidian were eventually transported over increasingly long distance. Throughout the millennia of hunter-gatherer occupations a dearth of local toolstone made it necessary to import more desirable lithic materials, often from sources hundreds of kilometers distant. Orthoquartzite from the Tandilia Range in southeast Buenos Aires Province was the most common toolstone transported. A few artifacts of exotic reddish siliceous rock, however, have been recorded. This toolstone was found to be macroscopically and microscopically identical to that of Fishtail points from Uruguay, which were made of stone from an outcropping that supplied local quarries and workshops (**MT 25-1,** "Early human occupation in the NW plains of Uruguay"). Flegenheimer concludes that the reddish silicious rock from southern Uruguay was likely transported 400–500 km across the plains to sites in Buenos Aires Province by hunter-gatherers who thrived on established social contacts.

Fishtail points in assemblages from the Argentine Pampas and Uruguay exhibit similar lithic technology. Most were made using flake blanks of approximately the same thickness as the finished product. They have been useful to researchers studying platform preparation and flaking techniques.

Miniature points

Miniature points, found at sites in both North and South America, are scaled-down replicas of points used as hunting weapons in late-Pleistocene/early-Holocene hunter-gatherer societies. The purpose they served has been speculated as toys, practice pieces made by apprentice toolmakers, and ceremonial objects. Of six miniature points found at Cerro El Sombrero Cima, five were Fishtail points; one was an undescribed stemmed-type point.

For Flegenheimer, miniatures of all kinds found in archaeological contexts call for special attention to their relationship to and similarity with full-sized dart and spear projectile points. "Some authors maintain that weaponry and hunting, as well as fluting and raw material selection, held a role of prestige, represented costly signaling or were symbolically power-

ful in Paleoindian society," Flegenheimer says in a 2015 article in *World Archaeology*. "Also, these points in themselves could have been considered powerful objects." Miniature points found in some assemblages therefore assume a special relevance. Whether manufactured as toys or tokens of ceremony and ritual, they support the special cultural significance of projectile points among early settlers.

Miniatures are scaled-down versions of full-size points. In the process of miniaturizing, however, some features are deemphasized and others are exaggerated. The result is a stylized Fishtail point reduced in size. "Miniaturizing involves manipulating reality through abstraction and compression," Flegenheimer explains. "The reduction in size also reduces detail, thus demanding experimentation and selection." Which details the toolmaker chose to emphasize and which to gloss over may tell scientists whether a miniature point was intended as a toy, amulet, weapon, lure, ornament, or offering, although the context is significantly more important than the characteristics of the points themselves. Interpreting its function is further complicated by the possibility that a specimen may have been intended to fulfill several functions. Some studies suggest that among hunter-gatherers miniature points were either made by children or by adults as toys for children to use when learning adult roles.

The excavation team filming a documentary about Cerro El Sombrero (seen in the background), 2016.

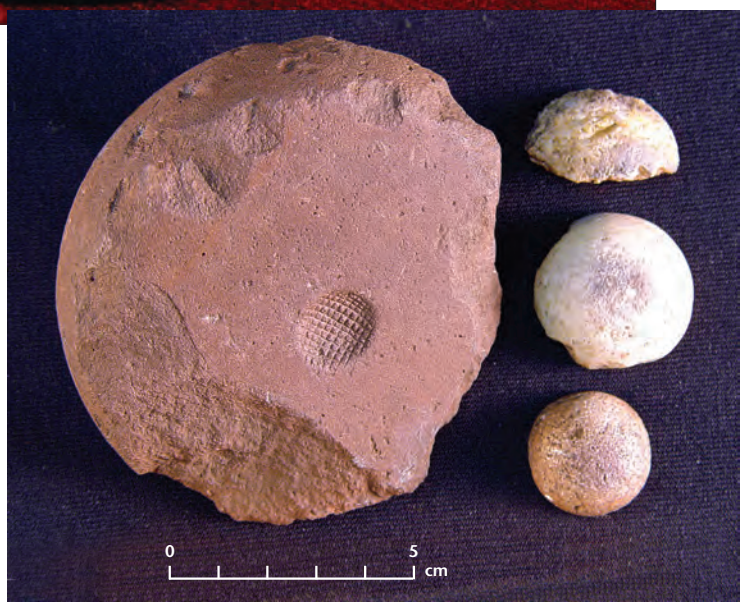
Miniatures have been discovered on the surface and through excavation. At Cerro El Sombrero Cima, all miniature points were complete save for one with a small bending fracture at the tip, a remarkable state of preservation considering that other tool types found in the area suffer from widespread breakage. Blanks used to make miniature points may have been debitage from the manufacture of full-sized points. In all miniatures, dorsal ridges run across the flake blank and are shaped by marginal bifacial or unifacial

retouch, mostly on the stems. Edges were simply shaped by abrading.

Use-wear studies show that these miniature points weren't used on organic resources, nor do they show evidence of hafting, which leads Flegenheimer to conclude that they weren't functional tools intended for processing animal or plant substances.

Early-Holocene skeletal remains from the Pampas

Since the late 19th century the Argentine Pampas have been prominent in theories of the peopling of South America. Two sites containing bones of humans and megafauna have been excavated at El Guanaco. The sites lie about 500 m distant from one another northeast of a shallow lake. The skeletal remains of extinct megamammals date to about 10,000 RCYBP. In the lowermost level of one site were found the bones of a human adult and infant. A rib from the child dated to 8123 ± 82 RCYBP, making these burials among the earliest human bones recovered in the region.



Small spheres and discoidal stone.

"Discoveries of human bones in Argentina follow the general tendency observed for the Americas, which is that early human burials are infrequently found," Flegenheimer says. "Although currently 17 sites with dates between 12,000 and 8000 RCYBP have been published for the Pampean region, only one is known to include early human remains." In the years since 2010, when Flegenheimer wrote her paper on skeletal remains, other early human remains have been discovered in the Pampas.

The future of archaeology in the Southern Cone

"Personally," Flegenheimer confesses, "I have always been more interested in trying to understand how people lived and thought rather than in working out the chronology and routes of early peopling." Another issue that she considers basic in Argentina is to concentrate on public archaeology. "All our studies of school students and the general public have shown that people are not aware that the peopling of Argentina took place so long ago," she laments. "This is a pity and also problematic in regards to our identity and feeling of belonging to a place, so I think an important area of future work is science communication."

Says Argentinean colleague Natalia Mazzia, "Nora is one of those archaeologists that opened the door to systematic research on the pre-Hispanic past in the Buenos Aires province. Since she was young, she started to climb and love the hills where early Pampean settlers used to live. Those hills, early hunter-gatherers, and lithic stone tools set the course of her career. Nora started working at the Natural Sciences Museum of La Plata, where she took her grade studies. But some years later, she built with great effort a new place of work in Necochea, far from central research centers but next to the community."

Mazzia recalls that Flegenheimer, in her quest to comprehend lithic materials, learned to knap: "She searched for quality knappable raw materials and found indigenous quarries. With each step she created lines of research that have continuity today because of the working team Nora brought together."

Mazzia credits Flegenheimer with teaching her the work of an archaeologist and showing her "a way of doing things, how to get along the work with daily life and daily life with working tasks." She also passed on her love for the hills. "Each time I came back from fieldwork," Mazzia recalls, "and I unfolded the findings over the lab table Nora smiled because she smelled the scent of the hills inside the bags."

The friendship of these two colleagues has endured for more than a decade. "Ever since I met Nora, around the year 2001, I have heard from her that she is very close to retirement," Mazzia tells us. "I doubt that when she finally retires from work she will really get away from the past she got pieced together and all the stories she still has to tell."

–Martha Deeringer

How to contact the principal of this article:
e-mail: norafleg@gmail.com

Brazil

continued from page 14

that people are beginning to realize there's more to the picture of people moving into an area than just subsistence and technology. An environment is essentially turned into a cultural landscape because colonizers impose a symbolic understanding and world view onto this area." She explains that indigenous people today explain their environments in those terms, not simply in the material aspects of human life. Archaeologists are naturally most concerned with material remains left behind, but they have to be attuned to the symbolic component to every human society. This symbolic picture will be projected onto any area people come to settle in.

Gruhn cautions against short-sightedness in exploring early cultures. "It's important to realize that there's more to this prehistoric manifestation than just these lithic artifacts. For example, these very simple tools show up early in Brazil, but good heavens, in Brazil we know from living and historical tribes that the real majority of the material culture of these people was perishable—made of vegetable materials like baskets, hammocks, extensive use of wood and plants. The botanical knowledge of these people is just awesome! The masks, beautiful feather work, beautiful conception of the world. Houses were arranged in a circle in central Brazil, and this corresponded to social divisions within the culture. We have to imagine this kind of highly symbolic world existed there because it exists among all human beings."

–Katy Dycus

The Bluefish Caves

continued from page 4

modifications." Despite these reservations, she passionately reaffirms her confidence in her results.

Crusading for more evidence

With these Bluefish Caves data, Bourgeon, Burke, and Higham have thrown down the gauntlet (or trowel, if you will) in the argument on human expansion into the Americas. The dates from these human-modified bone specimens, they argue, "confirm that Bluefish Caves is the oldest known archaeological site in North America" and prove that humans were already present in Eastern Beringia during the LGM—and give a boost to the Beringian Standstill hypothesis.

Despite the quite small number of definite human-modified bones found at Bluefish Caves, Bourgeon writes in her analysis that this isn't at all surprising. Unlike other open-air Beringian sites that often contain lithic collections, tools, and hearths that characterize them as relatively long-term occupation sites, Bluefish Caves likely served as a retreat during infrequent hunting trips to the area. The rising sea level over time that has inundated much of Beringia has also created difficulty in collecting data and finding more sites. Bourgeon currently is developing a postdoctoral project with the goal of pursuing further research at Bluefish Caves and its surrounding areas to bolster the Beringian Standstill hypothesis. "The antiquity of the human presence at this site shouldn't be dismissed," she insists. "I am convinced that more evidence is just waiting to be found and that future research in Beringia will strengthen the Standstill hypothesis."

–Jessy Schroeder

How to contact the principals of this article:
Lauriane Bourgeon, Zooarchaeologist
Département d'anthropologie
Université de Montréal (QC)
e-mail: Lauriane.bourgeon@umontreal.ca

Ariane Burke, Professeure Titulaire
Directrice scientifique, Laboratoire d'Ecomorphologie et de Paleoanthropologie
Universite de Montreal, Department d'Anthropologie
C.P. 6128, Centre-Ville
Montreal, QC, Canada H3C 3J7
e-mail: a.burke@umontreal.ca
http://www.hominindispersals.net/

Thomas Higham
Deputy Director
Oxford Radiocarbon Accelerator Unit
Oxford University
https://www.palaeochron.orgCrusading for more evidence

Suggested Readings

Bourgeon, L. 2015 Bluefish Cave II (Yukon Territory, Canada): Taphonomic study of a bone assemblage. *PaleoAmerica* 1(1):105–8.

Bourgeon, L., A. Burke, and T. Higham 2017 Earliest Human presence in North America dated to the Last Glacial Maximum: New radiocarbon Dates from Bluefish Caves, Canada. *PloS ONE* 12(1):e0169486

Braun, D. R., M. Pante, and W. Archer 2016 Cut Marks on bone surfaces: Influences on variation in the form of traces of ancient behavior. *Interface Focus* 6(3):20160006.

Cinq-Mars, J. 1979 Bluefish Cave I: A Late Pleistocene eastern Beringian cave deposit in the Northern Yukon. *Canadian Journal of Archaeology* 3:1–32.

Mulligan, C. J., and E. J. E. Szathmáry 2016 The peopling of the Americas and the origin of the Beringian occupation model. *American Journal of Physical Anthropology* DOI 10.1002/ajpa.23152

PALEOAMERICA

A Journal of Early Human Migration and Dispersal

Electronic and print editions

The Center for the Study of the First Americans, in partnership with Taylor & Francis publishers, present ***PaleoAmerica***–a peer-reviewed, quarterly journal focused on the Pleistocene human colonization of the New World.

PaleoAmerica is an interdisciplinary journal that covers all aspects of the study of the peopling of the Americas, including archaeology, genetics, paleoanthropology, linguistics, and paleoenvironmental sciences. ***PaleoAmerica***'s geographic focus includes North and South America, the Caribbean, northeast Asia (Siberia, Japan, China, Korea, and Mongolia), and southwest Europe. Moreover, ***PaleoAmerica*** reports on the study of the dispersal of modern humans in other parts of the world such as Australia and southeast Asia.

Each issue of ***PaleoAmerica*** provides at least one robust summary of current knowledge about major research into a specific avenue of scientific inquiry or geographic region; several long reports on new scientific discoveries; brief reports on new research; and one or two observations written from the perspective of leaders in their fields. In other words, each issue is full of news, views, and reviews.

Special Pricing for CSFA Members only!
Center members receive a significant discount on this publication–up to 78% off the subscription prices offered directly from Taylor & Francis publishers.

- **Print** version is $35 (Exclusive to CSFA members.)
- **Electronic** version is $22 (Subscribers to the electronic version have access to the current and all past issues.)

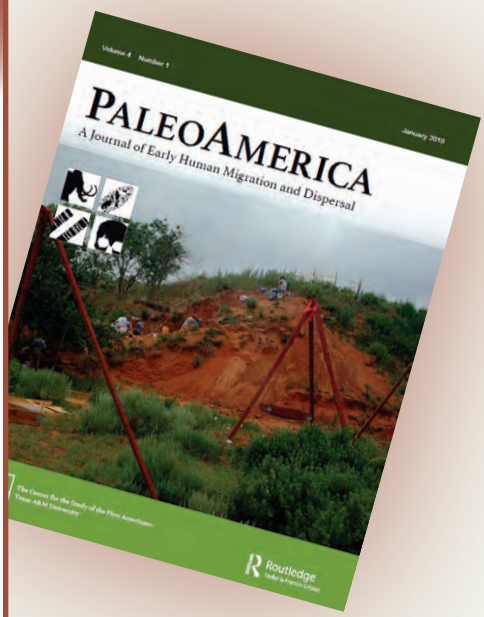
All ***PaleoAmerica*** subscriptions are for one calendar year and include four issues.

Order your subscription using the Order Form on the inside front cover of this issue or online at **www.centerfirstamericans.com**

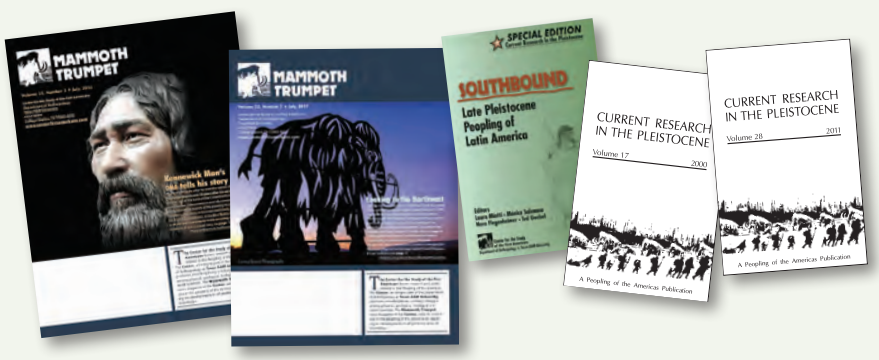
PALEOAMERICA
Volume 4, Issue 1 ■ January, 2018
approx. 95 pp.

TABLE OF CONTENTS

To submit a manuscript, contact editor Ted Goebel at goebel@tamu.edu



Other CSFA Publications



CSFA publications available in limited quantities include:

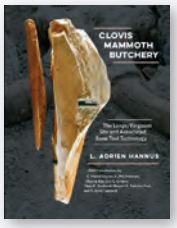
- Past issues of *Mammoth Trumpet*
- Past issues of *Current Research in the Pleistocene*
- *Southbound*

Visit **www.centerfirstamericans.com** for price and availability, or e-mail us at **csfa@tamu.edu,** or call us at **979-845-4046.**

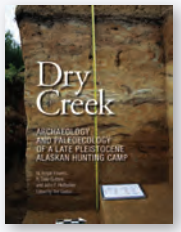
CSFA Books

These books can only be ordered through TAMU Press. To order these publications, phone 800-826-8911, go online at www.tamupress.com, or use the form below.

Other titles are available on the TAMU Press website.



Clovis Mammoth Butchery: The Lange/Ferguson Site and Associated Bone Tool Technology, L. Adrien Hannus. 2018. 288 pages. Hardback (ISBN 978-1-62349-592-3).
Reg. price $60.00
CSFA members $48.00

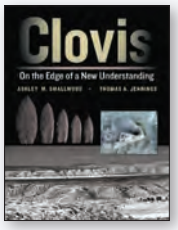


Dry Creek: Archaeology and Paleoecology of a Late Pleistocene Alaskan Hunting Camp, W. Roger Powers, R. Dale Guthrie, and John F. Hoffecker; edited by Ted Goebel. 2017. 344 pages. Hardback (ISBN 978-1-62349-538-1).
Reg. price $50.00
CSFA members $40.00

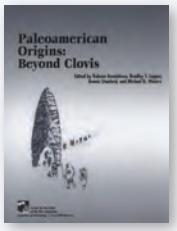
The Hogeye Clovis Cache, Michael R. Waters and Thomas A. Jennings. 2015. 159 pages. Hardback or e-book (ISBN 978-1-62349-214-4).
Reg. price $30.00
CSFA members $24.00

From the Yenisei to the Yukon: Interpreting Lithic Assemblage Variability in Late Pleistocene/Early Holocene Beringia, Ted Goebel and Ian Buvit, editors. 2011. 408 pages. Hardback or e-book (ISBN 978-1-60344-321-0).
Reg. price $80.00
CSFA members $64.00

Emergence and Diversity of Modern Human Behavior in Paleolithic Asia, Yousuke Kaifu, Masami Izuho, Ted Goebel, Hiroyuki Sato, and Akira Ono. 2014. 230 pages/ Hardback (ISBN 978-1-62349-276-2).
Reg. price $65.00
CSFA members $52.00

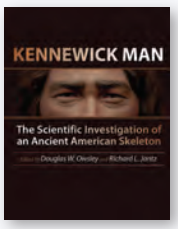


Clovis: On the Edge of a New Understanding, Ashley M. Smallwood and Thomas A. Jennings, editors. 2014. 376 pages. Hardback or e-book (ISBN 978-1-62349-201-4).
Reg. price $50.00
CSFA members $40.00

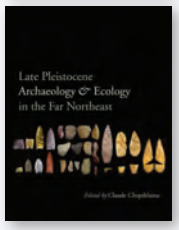


Paleoamerican Origins: Beyond Clovis, Robson Bonnichsen, Bradley T. Lepper, Dennis Stanford, and Michael R. Waters, editors. 2005. 384 pages. Paperback (ISBN 978-1-603448-12-3).
Reg. price $45.00
CSFA members $36.00

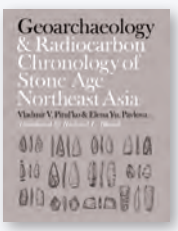
Paleoamerican Odyssey, Kelly E. Graf, Caroline V. Ketron, and Michael R. Waters, editors. 2014. 584 pages. Paperback (ISBN 978-1-62349-192-5)
Reg. price $45.00
CSFA members $36.00



Kennewick Man: The Scientific Investigation of an Ancient American Skeleton, Douglas W. Owsley and Richard L. Jantz, editors. 2014. 600 pages. Hardback (ISBN 978-1-62349-200-7).
Reg. price $75.00
CSFA members $60.00

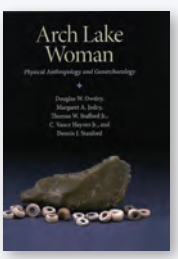


Late Pleistocene Archaeology and Ecology in the Far Northeast, Claude Chapdelaine, editor. 2012. 264 pages. Hardback or e-book (ISBN 978-1-60344-790-4).
Reg. price $68.00
CSFA members $54.40



Geoarcheology and Radiocarbon Chronology of Stone Age North East Asia, Vladimir V. Pitul'ko and Elena Yu. Pavlova; Richard L. Bland, trans. 2016. 256 pages. Hardback (ISBN 978-1-62349-330-1).
Reg. price $60.00
CSFA members $48.00

Clovis Lithic Technology: Investigation of a Stratified Workshop at the Gault Site, Texas, Michael R. Waters, Charlotte D. Pevny, and David L. Carlson. 2011. 224 pages. Hardback or e-book (ISBN 978-1-60344-278-7).
Reg. price $45.00
CSFA members $36.00



Arch Lake Woman: Physical Anthropology and Geoarchaeology, Douglas W. Owsley, Margaret A. Jodry, Thomas W. Stafford, C. Vance Haynes, and Dennis J. Stanford. 2010. 93 pages. Hardback (ISBN 978-1-60344-208-4).
Reg. price $30.00
CSFA members $24.00

ORDER FORM FOR BOOKS

Title or ISBN	Unit price	Qty.	Total cost

Payment

☐ Check ☐ VISA ☐ MC ☐ AmEx ☐ Discover

Credit card no. _____

Expires ____ (M/M) ____ (Y/Y) 3-digit verification code _____ (on back of card)

Signature _____

Ship to (please print clearly):

Name _____

Address _____

City _____ State _____ Zip _____

e-mail _____ phone _____

Shipping & handling: U.S., $6+$1 each add. book
Foreign, $11+$3 each add. book

Subtotal

Texas residents add 8.25% sales tax

Total

Mail this form with your check or money order to:
Texas A&M University Press
4354 TAMU
College Station, TX 77843-4354

To order online go to www.tamupress.com. Enter code **CUCSFA** at checkout to receive your Center member discount of 20%.

To order by phone call 800-826-8911 (fax 888-617-2421), mention code **CUCSFA** for Center member discount of 20%.