History in the Bones

Last year a nearly complete human skeleton with a spearhead embedded in its pelvis was found half buried on the shores of the Columbia River in Kennewick, Washington. The fossil was recovered by anthropologist James Chatters, who sent samples to R. Ervin Taylor's laboratory at the University of California, Riverside, for dating. The dates of 8,410 ± 60 years B.P. (UCR 3476) place this individual in the midst of the Paleoindian world. Several other human remains of similar age have been found in the Americas, but this is the first widely publicized case in which scientists are contesting the process of repatriation of human remains to Native Americans.

The Native American Graves Protection and Repatriation Act (NAGPRA) of 1990 has already been applied to the reburial of two fossils. One of these was the 8,000-year-old fossil found in Hourglass Cave. Study of this individual by a team of anthropologists included sampling for accelerator mass spectrometer dating, histological and DNA analyses. In addition, full documentation and casts of the fossil were produced before it was returned to the Southern Ute tribe.[2] The second case is far more unfortunate. A nearly complete and well-preserved fossil found in Buhl, Idaho, dated to 10,675 B.P., was returned to the Shoshone for reburial after only limited study by a student.

Scientists involved in the study of the first Americans are determined not to let this happen again. So two months after it was found, Kennewick Man became the subject of a legal dispute among anthropologists, the U.S. Army Corps and local Indian tribes. But there is even more controversy surrounding the fossil from Kennewick.[1] The remains have been described as Caucasian by the three anthropologists (James Chatters and Catherine MacMillan of Central Washington University and Grover Krantz of Washington State University) who had a chance to examine it before the Army Corps took custody of it. If the morphological assessment were to prove correct, it would have huge implications. In the legal world, it would imply that the local Native American group bears no immediate ancestor-descendant relationship to this individual; from a scientific perspective, it would imply that Paleoindians may not have been of Mongoloid descent after all, or at least not exclusively so.

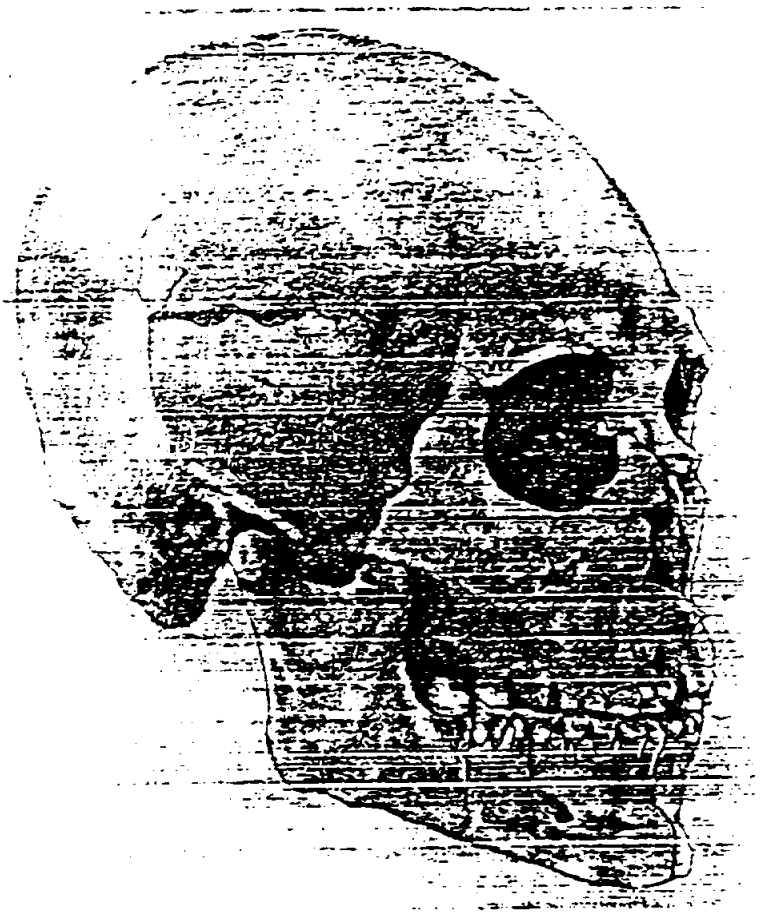

Figure 1. Kennewick Man drawn by Jamie Claire Chatters. © 1996.

Taking the scientific perspective first, how earth-shattering would that statement be? This finding and the questions it raises reach into the heart of the debate on Amerindian origins. Who, after all, were the first Americans? When did they come, where did they come from, which routes did they take, and how does present-day diversity relate to the colonization process? After a hundred years of research and controversy, how far are we from the answers to these questions?

Most archeologists would say we are not far at all, for many have come close to agreeing on answers to four of the five preceding questions. North

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America has a comparatively rich Paleoindian archeological record, and the sterility of stratigraphic layers antedating the Clovis occupation has come to stand as strong negative evidence of a Pleistocene occupation. Although this assertion is largely based on North American evidence it is assumed to apply to South America as well because all migrants entering the continent through the Bering Strait would have had to go through the north. Therefore, the answer to when the first Americans came should be at about 12,000 to 11,500 years ago the age of the earliest well-dated North American sites. Archeology has also offered answers to another three of the questions I posed. The first Americans were the Clovis people, they came from Northeast Asia, and used a route from the Bering Strait through a narrow corridor between the ice sheets into what is now the southern United States and beyond.[1]

In the 1980s, this view was strongly supported by conclusions drawn from biological and linguistic data. Joseph Greenberg from Stanford University clustered American aboriginal linguistic diversity into manageable units and classified them into three unrelated families Amerind, Na-Dene, and Aleut-Eskimo. His conclusions were highly concordant with those drawn from dental morphology by Christy Turner II from Arizona State University and those of Stephen Zegura who, at the University of Arizona, was working with gene frequencies. In 1986 the integration of these data led to the joint formulation of a model of occupation of the continent proposing that the Americas were colonized by three discrete waves of Asiatic peoples.[2] According to that model, the first wave, speakers of Amerind, which many consider to be a linguistic super-phylum, entered the continent at the end of the Pleistocene and gave rise to the vast majority of present-day Native American tribes and languages in North, Central, and South America. The second wave, speakers of Na-Dene, colonized the area of the North American northwest coast. The last wave, of Aleut-Eskimo speakers, occupied peri-arctic lands. This model, based on linguistics, genetics, and dental morphology, not only agrees with the view of a late occupation held by most archeologists, but offers a mechanism, in terms of discrete dispersal events, to explain the largest partitions within recent Amerindian diversity. Thus, it offers a partial answer to the last of the questions I posed.

So why should this area of research still be one of the most controversial? Several issues have consistently fueled the debate. These are varied, and include the integrity of the linguistic families Greenberg proposed and the level of genetic distinction between Na-Dene and Eskimos. However here I will concentrate on two points that are not related to how we classify present variation, but to the character and integration of the prehistoric evidence, which is where Kennewick man will have to fit.

The first is the familiar fact that absence of evidence is not evidence of absence. Thus, the date of the first occupation, as well as the character of the earliest assemblages, has been continuously challenged by potentially older sites. These, mainly in South America, proved inconclusive. However, last year the site of Monte Verde in Chile passed all archeological scrutiny,[3] and extended the date of occupation to a minimum of 12,500 years B.P., indisputably beyond the 11,500 year B.P. Clovis threshold. And Monte Verde does not stand alone. W. Neves from the University of Sao Paulo has been carrying out a program of direct ^{14}C accelerator dating of Paleoindian remains from the region of Lagoa Santa in Brasil and has obtained dates that closely match those from Chile. These data indicate that the entrance of Clovis people 11,500 years ago must have been preceded by at least one earlier wave of migrants who settled further south.

The second point has to do with the nature of data derived solely from recent populations. Genetics and, to a lesser extent, historical linguistics have been used to reconstruct evolutionary events on the basis of present-day variation. These events are derived from the integrity and diversity of present populations and their interrelationships as inferred from the markers being used in order to obtain genealogical trees and a possible number of ancestral groups. Besides methodological arguments within each discipline related to the application of linguistic reconstructions beyond the 5,000 to 6,000-year range and the problem of interpreting gene trees and polymorphisms in terms of population histories, these data, for those interested in prehistory, have the further limitation of building models on the basis only of the survivors of the evolutionary process. We know that languages can be borrowed or replaced and that populations become extinct or swamped by others. Such populations, extinct in terms of their linguistic or genetic identity, would not only have been part of the history but may have played a significant role in the process of colonization and substructuring of groups. Yet they cannot be included in any history reconstructed from linguistic and genetic data. This is probably the major source of discrepancies between the three-wave model or recent hypotheses based on mtDNA and Y-chromosome diversity,[4–7] all of which have been derived from recent data, and the American human fossil record.

No one would contest the fact that human fossils are the only direct evidence of the presence, at a specific time and place, of people with specific phenotypical characteristics. The question lies in how to read the skeletal characteristics in terms of population and racial affinities. In the minds of many archeologists and geneticists, there is considerable doubt about whether this can be done at all. This doubt arises from the long history of physical anthropology, in which interpretations of variation have fluctuated widely, from early twentieth-century unscientific views on polytypism and racial subdivision to recent emphasis on functional plasticity and quantitatively based measures of variation. Archeologists and geneticists have thus remained skeptical about the extent to which prehistoric fossils provide a reliable phylogenetic signature. However, a host of studies has shown that this phylogenetic signal can be recognized[8–12] and that the morphological relationships drawn from living people can be matched to genetic patterns.[13,14] If the phylogenetic systematics of recent human fossils allow

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identification of the direction of evolutionary change, what can be said about the morphology of American human fossils?

Gentry Steele,[15] of Texas A & M University, has studied all available North American Paleoindian fossils. He has observed that the features that characterize both typical Mongoloids and recent Amerindians are absent from most of these fossils. He interprets the distinctive morphology of Paleoindians as deriving from a yet unspecialized northern Asian population or a more generalized southern Asian source.[15] W. Neves'[16] analysis of the large Paleoindian series from the region of Lagoa Santa, Brazil, and Sabana de Bogota Colombia, point to the same pronounced morphological differences between the early material and the extant Amerindians that Steele observed in North America.

This non-Mongoloid or, at least, not typically Mongoloid, pattern of cranial morphology is also reflected in the teeth, one of the sources of data for the three-wave model. Joseph Powell from the University of New Mexico and Rebeca Haydenblit from the Hebrew University of Jerusalem have used C. Turner's methodology to study the dental pattern in early and later Holocene Amerindian remains from, respectively, North and Central America. C. Turner identified two dental complexes in Asia, a southern and evolutionarily ancestral one called Sundadonty, and a later, more specialized one, typical of Northeast Asians, called Sinodonty.[17] In a large sample of recent Amerindians, he observed only the Sinodont pattern,[18] and therefore concluded that all Amerindians derive from the specialized northeast Asian form. The results of R. Haydenblit[19] and J. Powell[20] show that the earlier populations had a Sundadont dental morphology. These investigators data differ from Turner's in ways that parallel the differences between generalized and typical Mongoloids in Asia.

The differences between Paleoindians and recent American indigenous groups lie, therefore, in the more generalized nature of the morphology of Paleoindians. Specifically, they lack the dental and cranial specializations observed in typical Mongoloids, be these Chinese, Japanese, or Amerindians. This is consistent with the direction of evolutionary change in Asia. The group of earliest modern fossils available, such as those from Niah, Tabon, and Zhoukoudian Upper Cave 101, appear morphologically closer to Australians than to recent Southeast Asians and Chinese.[21-23] Later remains, fossils such as those from Wajak, Minatogawa and Liujiang, as well as the Jomonese, share the basic cranial Mongoloid traits of a relatively large and coronally flat face, a broader and shorter vault, and a Sundadont dentition, currently observed to varying degrees in Southeast Asian populations and the Ainu.[13-17, 24-25] Holocene Chinese and recent Japanese, Koreans, Mongolians, Siberians, and Chinese share an intensification of these generalized Mongoloid dental and cranial traits: the vault broader and shorter and the face longer, with taller orbits and cheeks. The coronal facial flatness is also expressed in zygomatic projection and frontal orientation, as well as a Sinodont dentition.[13,17] This trait intensification is what characterizes "typical" Mongoloids and what is missing in the Paleoindian remains. This indicates that, within the context of Mongoloid differentiation, the groups to first occupy the Americas were not part of the populations that had specialized toward a typical Mongoloid morphology in Asia at that time. This is perfectly compatible with the geographical distribution of potential generalized and derived Mongoloid sources in Asia up to the end of the Pleistocene and into the Holocene.[26]

At either extreme of the continent, the recent Aleutian and Fueguian populations differ from other extant Amerindians in ways that suggest the retention of traits from the Paleoindian populations...

This view does, however, raise questions about how the present linguistic, genetic, and dental morphological patterns developed. Two possibilities exist. It could be argued that a single ancestral wave of generalized Mongoloids evolved a more specialized Mongoloid cranial and dental morphology in the Americas. The degree of homoplasy with developments in Asia makes this hypothesis unlikely. The second and more plausible hypothesis is that an early wave of migrants with non-Mongoloid features was followed by a later dispersal of typical Mongoloids who replaced the Paleoindian stock. From a morphological point of view, studies of recent populations suggest that if the first American populations were replaced by typical Mongoloids, such process could not have been complete. At either extreme of the continent, the recent Aleutian and Fueguian populations differ from other extant Amerindians in ways that suggest the retention of traits from the Paleoindian populations[26] including greater robusticity, vault proportions, degree of facial flatness, as well as different dental morphology. This indicates a more complex process for the evolution of Amerindian diversity. A dispersal subsequent to the one that gave rise to the first Americans could be reflected by the limited distribution of the mtDNA haplogroup B in the Americas, an Asian marker absent in present Siberians. However, two facts preclude that interpretation. The first is the identification of the base pair deletion in the DNA extracted from the Hourglass cave fossil; the second is the fact that present Amerinds (in the linguistic sense) also have, in addition to haplogroup B, three other mtDNA haplogroups, that are inferred to have diverged from Siberian populations between 20,000 and 40,000 years ago,[5] thus refuting the notion of a replacement of the earlier groups. It could be argued that, like the Fueguian morphology, the distribution of mtDNA lineages indicates the actual complexity in the process of population replacement. This complexity may include different stories for paleoindian males and females, with the latter

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perhaps being assimilated into the immigrant population. However these questions cannot be tackled from single-gene genealogies.

So even before the discovery of Kennewick Man last year, the conventional answers to the five questions posed at the beginning of this article had already been seriously challenged. In terms of archeology, an earlier date of 15,000 to 13,000 years ago for the colonization of the continent is not wildly discordant, though it does obviously prompt other questions. Why are these earlier settlements in the south? Which route (a coastal one?) did these early migrants use? How can we archeologically characterize these pre-Clovis groups? However it is the morphological data that are disclosing the complexity of the colonization of the Americas between 15,000 and 5,000 years ago, suggesting that it is likely to have involved higher levels of diversity than were present later and, consequently, high levels of extinction of some of the earlier groups. Morphological data are raising new questions about identity and the evolutionary mechanisms of differentiation and adaptation: it is increasingly clear that they will also be the main source of the answers.

How, then, does Kennewick Man fit into these conventional and newer views on the identity of the first Americans? It could be argued that these remains just add to the evidence of marked differences between Paleoindians and recent native Americans, and the likely extinction of some of the earlier groups. However, Kennewick Man does much more than that. The arguments of Steele, Neves, Powell and Haydenblit, as well as my own argument based on the Fueguian data, all accept that Paleoindians are Mongoloids, although as described, more morphologically generalized than the groups recognized as "typical" Mongoloids who inhabit northeastern Asia today. The fossil from Kennewick suggests that this may not apply to all Paleoindian remains. The Kennewick individual differs from both typical and generalized Mongoloids in the proportions of the vault, the position of its maximum breadth, the smaller breadth and height of the face, the receding and short zygomatic arches on which a pronounced canine fossa is visible, a very projecting nose and a pronounced, deep chin.[1] These traits, in this combination, are generally observed in recent Caucasian populations. Moreover, this is not the only case in which a Paleoindian has been described as Caucasian. This month, a morphometric analysis of the Spirit Cave mummy by Richard Jantz of the University of Tennessee, radiocarbon dated to 9,415 ± 25 B.P., suggested that this fossil, like Kennewick Man, lies closer to Europeans than to Mongoloids.[27]

The Kennewick individual differs from both typical and generalized Mongoloids...

These "Caucasian" fossils in the Americas suggest a whole new range of questions. How many different populations crossed the Bering Strait between 15,000 and 10,000 years ago? Can we identify these groups in terms of regional differentiation and temporal levels of diversity in Paleoindian remains? How do these various late Pleistocene or early Holocene groups relate to subsequent Amerindian populations? Which would be the potential ancestral sources in Northeast Asia of populations with Caucasian affinities?

There are many leads as to where one could start tackling questions like these. Caucasian rather than Mongoloid affinities of Amerindians have been suggested by the multivariate analyses of L. Cavalli-Sforza[28] and W.W. Howells.[6] From the perspective of linguistics, there have been suggestions (speculations?) that Basque may be a remote branch of the Dene-Caucasian mega-linguistic group (see discussions in Mother Tongue[29,30]). This suggests a remote common source in late Pleistocene northern Eurasian populations and points to the northwest pacific coast as the easternmost extension of such a group whose genetic origins would lie in the Eurasian Upper Paleolithic. However, if this were the case, the mechanism by which the language related to this northern Eurasian population survived (Na-Dene) but not the biological identity (as in the case of the Finnish) would have to be explained.

Archeology provides evidence that takes the possibility of a late Pleistocene northern Eurasian population one step further. Assemblages akin to western Upper Paleolithic ones are found in Siberia from around 35,000 years B.P.[31] The fossil of Malta, near lake Baikal, has a Eurasian dental morphology.[18] However, if these were to represent the non-Mongoloid source of some Paleoindians, the unsophisticated character of the earliest archeological assemblages in the Americas would have to be explained. There is also morphological evidence that the area of northwestern China and western Mongolia, presently inhabited by typical Mongoloids, was occupied by peoples of Caucasian affinities until some point in the Holocene. These groups not only provide potential ancestral diversity in northwest Asia at the end of the Pleistocene but, together with the survival of Turkish linguistic isolates like the Khazakh in western Mongolia, highlight the effects of complete and incomplete replacement events in the recent history of human populations. Therefore, fossils like Kennewick man not only broaden the study of the biological origins and subsequent differentiation of the first Americans, but also enrich our understanding of human diversity worldwide prior to Holocene demographic expansions.

Whether it will be possible to compare Kennewick Man to other fossils in the Americas and Asia is, however, still in dispute. The Umatilla tribes, the Yakama, Nez Perce, Colville, and Wanapum filed a joint claim for the remains with the U.S. Army Corps of Engineers, on whose land the skeleton was found. If their claim is accepted, this gives them the right to bury the fossil. And their claim was accepted by the U.S. Army Corps, which took custody of the fossil just over a month after its discovery, scheduling an immediate repatriation. This process

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was halted by a legal motion filed by a group of eight anthropologists (R. Bonnichsen of the Institute for the Study of the First Americans; L. Brace, of the University of Michigan; G. Gill, of the University of Wyoming; C. Vance Haynes of the University of Arizona; D. Stanford and D. Owsley of the Smithsonian Institution; R. Jantz, and G. Steele). The scientists are still waiting to hear whether or not they will be given the right to study the fossil before it is reburied. If that right is granted, a team of 25 scientists has been invited to examine and sample the fossil to obtain morphological, histological and genetic data.

The reburial of this or any other fossil is an irreparable loss to science. As is the case with all fossil remains claimed for reburial in any part of the world, this is not a question of a profaned burial ground, but a political issue. Tracing a direct ancestor-descendant relationship from an individual who lived approximately 400 generations ago is close to impossible. In this case, there is the added irony that this particular individual may have been, in general terms, closer to other nonaboriginal Americans than to the local Native Americans. Ultimately, it must be society that decides between claims based on the beliefs of a particular group and the claim that fossil evidence is part of the growth of scientific knowledge. In working toward making that decision, it is important that there be full awareness that fossils such as Kennewick man are central to anthropological work, for they hold the answer to questions about regional differentiation, adaptive trajectories, and patterns of extinction and survival. For this reason, it is disappointing that those fighting against the reburial of fossil remains have not received even the full support of all researchers in our field. The evidence from the fossils can never be replaced by genetic or linguistic data, for it can reach a part of our history of which no trace remains in the living population. The intentional destruction of fossil remains should be fought against in every case.

ACKNOWLEDGMENTS

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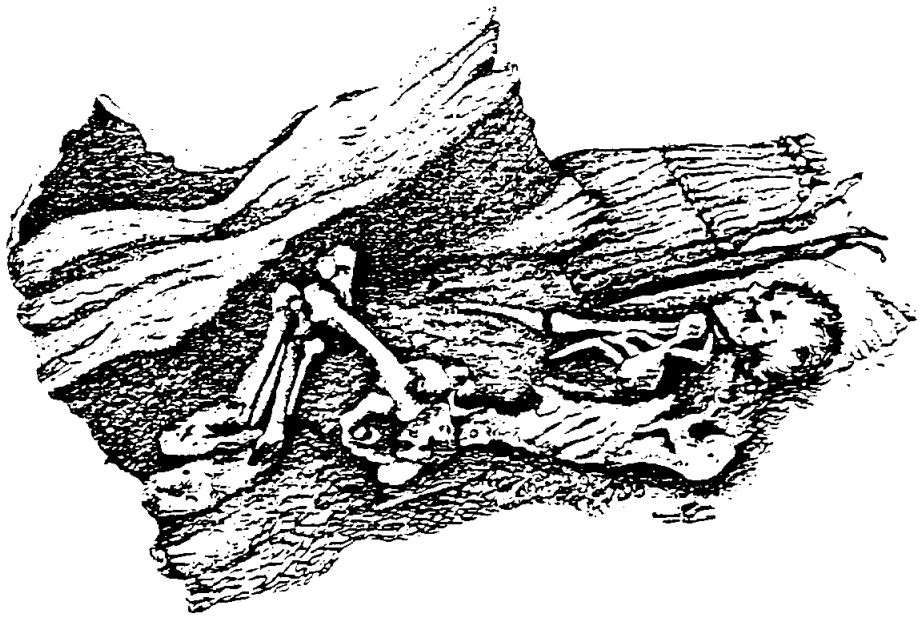

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Front Cover: The Spirit Cave Man as he was found. (*Denise Sims, Nevada State Museum*)

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PAPERS ON HOLOCENE BURIAL LOCALITIES PRESENTED AT THE TWENTY-FIFTH GREAT BASIN ANTHROPOLOGICAL CONFERENCE, October 10-12, 1996

Donald R. Tuohy and Amy Dansie

The majority of the following papers were delivered at the Twenty-fifth Great Basin Anthropological Conference at Symposium 15, which was chaired and organized by Amy Dansie and Donald R. Tuohy of the Nevada State Museum. The symposium abstract stated the following:

> The Accelerator Mass Spectrometry radiocarbon dates recently obtained on burials housed in the Nevada State Museum revealed two burial assemblages over 9,000 years old. The Spirit Cave mummy has received wide attention, but the other burials in the cave are also significant. A skeleton from Wizards Beach, Pyramid Lake, Nevada was also dated between 9,225 and 9,515 years B.P. Research on these two assemblages will be presented in the context of Great Basin prehistory and the issues relating to the peopling of the New World. The session will be concluded with open discussions on the issues of tribal affiliation and repatriation under "NAGPRA," an abbreviation that stands for the Native American Graves Protection and Repatriation Act of 1990.

This was not the first time an aboriginal burial in the Great Basin dated in excess of 9,000 years ago. L. S. Cressman's radiocarbon-dated sagebrush fiber sandals from Fort Rock Cave in the northern Great Basin in Oregon (Cressman 1977 frontispiece) dated just over 9,000 years ago at 9,053±350. But in our case, we had a mummy with hair on his head. At about 9,415 years old, the mummy turned out to be the oldest in North America. He was excavated in the Grimes Point foothills near Fallon, Nevada, in 1940 by Sydney M. and Georgia Wheeler.

Interest in Sydney Wheeler was revived recently in a paper by Alvin McLane entitled "S. M. Wheeler, Nevada Test Site's First Archaeologist," presented at the

Donald R. Tuohy is the Curator of Anthropology at the Nevada State Museum in Carson City, where Spirit Cave Man has been housed since 1940. Amy Dansie is the Anthropologist at the Museum.

COMPARISONS

There are a few Western Great Basin sites of the same age or younger than the tule matting and the diamond-plaited mat from Spirit Cave.

1. *Grimes Burial Shelter, Carson Sink.* This small rock shelter in the vicinity of Spirit Cave was disturbed by guano miners, and the matting and fragmentary human bones were given to Margaret Wheat, who reported the site to Sydney Wheeler. He investigated the site, finding little else, catalogued the finds, and recorded the site. During the search for additional examples of diamond plaiting in 1996, this essentially forgotten collection was discovered by Amy Dansie to have a large fragment of diamond plaiting. The textile was dated a little older than the Spirit Cave mummy, at 9,470±60 B.P. (UCR3477).

2. *Lake Winnemucca, western Nevada.* Hester (1974:2) who reported on archaeological materials recovered by amateurs from a tufa stack located at the southwestern end of Lake Winnemucca, western Nevada, had this to say about the date:

> An atlatl or spearthrower was discovered by the excavators near the base of the cave deposits, approximately 16 feet below the surface. At this approximate depth, lying just above the spearthrower, were several twined baskets. The group of baskets and the spearthrower appear to be two separate caches. A portion of one of the baskets has been radiocarbon-dated at 7,980±610 B.P. (I-6873). The radiocarbon determination suggests that the atlatl is at least 8000 years old, and given its stratigraphic position below the dated basketry, it is possibly even older.

The twined baskets were not illustrated, so we have nothing to compare Spirit Cave textiles with those from the tufa stack which was given a Berkeley site number of NV-Wa-197.

3. *Crypt Cave, located at the north end of Lake Winnemucca, western Nevada.* Charles Rozaire had noticed the distinctive weave of the diamond plaited matting fragment from Crypt Cave. He also mentioned Chimney Cave, but it has not been confirmed that such a textile is present in the collections. Both sites are among the dry caves excavated by Phil Orr in the middle 1950s. Radiocarbon results yielded a date of 9,120±60 B.P. (UCR 3483). The Crypt Cave specimen is shown in Figure 16.

4. *Fishbone Cave, Winnemucca Lake, western Nevada.* Two dates from Fishbone Cave, east side of Winnemucca Lake, on a bed of shredded bark associated with human bone fragments, bones of a marmot, horse, and camel, some basketry fragments, and two large chert knives were dated at 11,250±250 B.P. (L-245) and 10,900±300 B.P. (L-245) (Orr 1956).

5. *Shimmers Site A, Falcon Hill, Winnemucca Lake, western Nevada.* A z twined basketry from Shimmers Site A, on Falcon Hill, was radiocarbon dated at 9,540±120 B.P. (UCLA 675) (Hattori 1982:14). Eugene Hattori says open-twining is the earliest

technique present at Falcon Hill (Hattori 1982:96). Although his date is a little older than the dates on the cremation bags, the several dates are comparable.

6. *Pyramid Lake, western Nevada.* A two ply sagebrush fishing line from the north end of Pyramid Lake dated to 9,660±170 B.P. (GX-13744) (Tuohy 1988:212). Northern Side notched points from Wizards Beach also suggest significant time depth of human occupation at the north end of Pyramid Lake.

7. *Pyramid Lake, western Nevada:.* A partial skeleton at the north end of Pyramid Lake found by Peter Ting, an amateur, dated at 9515±155 B.P. (GX-19422-G), and at 9110±60 and 9225±60 B.P. (UCR3445).

CONCLUSION

The first radiocarbon dating of Spirit Cave artifacts was explained by Kirner *et al.* (1996) and Burky (1995-1996:126-133), and we have included the Accelerator Mass Spectrometry dates presently available in our Table 1. The AMS dating done so far confirms an age of 9,000 to 9,400 years for the mummy, Burial number 1, and the two cremations from Spirit Cave, Wizards Beach Man and Grimes Burial Shelter.

The Spirit Cave mummy, Wizards Beach Man, and the Kennewick Man (who was found by two young men near Kennewick, Washington on the banks of the Columbia River and was studied by James C. Chatters and dated by Donna Kirner of the University of California, Riverside, at 8,410±60 B.P. [UCR 3476]), all exhibit "Caucasoid traits," particularly on features of the skull (Chatters 1997:9-10). As R. L. Jantz and Douglas Owsley discuss in this issue, there may be a relationship between these ancient Americans and the ancient Ainu of Japan, a Caucasoid group predating the arrival of oriental traits of the modern Japanese. Modern American Indians have distinctly "Mongoloid genes" expressed in their make-up. There are five tribes and bands of Native Americans who are claiming Kennewick Man for reburial, as opposed to the physical anthropologists and archaeologists who want to study him further scientifically. The Kennewick Man case will be settled in a court of law. The Kennewick Man only had one artifact inside him, a projectile point, a leaf-shaped serrated Cascade point, partially healed within the ilium.

Further research on the diamond-plaited mats will be done by Catherine Fowler and Gene Hattori, who want to know the relationship of the mats to woven textiles in Hokkaido, Japan. They will send black-and-white photographs of Spirit Cave textiles to Japanese anthropologists to see if there are any similarities between Spirit Cave textiles and those of the ancient Ainu of Japan of 9,400 years ago. Genetic studies are under way in Japan, and the debate centers around the extent to which the ancient Ainu (Jomon culture) did or did not contribute genetically to the modern Japanese (Powledge and Rose 1996:36-44). A list of twenty-seven plants used by the Ainu was mentioned by Hitashi Watanabe (1964:38039), but how they used the plants to make textiles was not mentioned by the author.

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DATING THE SPIRIT CAVE MUMMY
The Value of Reexamination

D. L. Kirner, R. Burky, K. Selsor, D. George and R. E. Taylor
and J. R. Southon

INTRODUCTION

During the summer of 1940, S. M. and G. N. Wheeler conducted archaeological field work for the Nevada State Parks Commission in Churchill County, Nevada. They investigated a number of caves in the vicinity, hoping to find evidence of man's presence during the period when prehistoric Lake Lahontan was receding, approximately 10,000 years ago (Aschmann 1958). The summer's field work resulted in the documentation of twenty-six caves and shelters, most of them containing archaeological remains (Wheeler and Wheeler 1969). The remains were cataloged and stored at the Nevada State Museum in Carson City.

While conducting a collaborative research effort with the Nevada State Museum in 1994, the radiocarbon laboratory at the University of California, Riverside obtained radiocarbon age determinations on the hair and bone from the Spirit Cave mummy, one of the archaeological finds made by the Wheelers in 1940 (Kirner *et al.* 1996). Originally, the mummy was thought to be 1,500 to 2,000 years old. When the first two accelerator mass spectrometer (AMS) radiocarbon dates were done, the Spirit Cave mummy was discovered to be more than 9,400 years old. This article will focus on new data from Spirit Cave, as well as data from the surrounding area. The goal of this study is to demonstrate the value of reexamining existing museum collections using AMS radiocarbon dating.

METHODS

Donald Tuohy and Amy Dansie of the Nevada State Museum submitted a total of seventeen samples for radiocarbon age determinations between 1994 and 1997 from a variety of archaeological projects. The material included textiles, human bone, human hair, wood, and dog pads from a dog burial. Preservation of the material to be dated was good to excellent.

The pretreatment and processing varied according to the material being dated.

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The wood from an arrow shaft fragment from eastern Nevada was subjected to acid base-water-acid treatment, and dried overnight in a drying oven. The dried wood was then placed in a combustion tube with copper oxide and silver powder and combusted overnight at 900°C. The resulting CO_2 was graphitized on a vacuum line and sent to Lawrence Livermore National Laboratory for analysis.

All of the textile age determinations were performed on the total amino acids. The textile samples were cut into small pieces and sonicated in hydrochloric acid. The material was rinsed with distilled water and dried overnight. The proteins were hydrolyzed in hydrochloric acid, then isolated and purified on an ion exchange column. The total amino acids were collected in a combustion tube and combusted with the appropriate reagents. The CO_2 was graphitized and analyzed in the same manner as the wood samples.

The radiocarbon age determinations on the bone, hair and dog pads were also performed using total amino acids. The material was physically cleaned, then hydrolyzed in hydrochloric acid. The total amino acids were assessed using high performance liquid chromatography (HPLC), then collected and purified on an ion exchange column. The amino acids were combusted, graphitized and analyzed employing the same methods used on the wood and textiles.

DISCUSSION

The radiocarbon age determinations on the Spirit Cave bone range from 9,430±60 to 1,490±50 years B.P. (see Table 1 in Tuohy and Dansie, and background details in Dansie, this issue). Statistically, the radiocarbon age determinations on the hair from the mummy are the same as the associated bone dates. The textiles from Spirit Cave demonstrate a similar pattern, ranging from 9,460±60 to 1,650±60 years B.P. The concordance is striking between associated specimens. These dates identified Burial no. 1 as the adult female, and demonstrated the much later date of the young male individual, from the commingled fragmentary bone of two individuals collected by the Wheelers. In addition, the coiled basket fragment from the cave, similar to Lovelock Culture coiling in other sites, dates to 2,210±60 years B.P. This agrees well with the basketry sequence of the area. The twined grass matting date demonstrates a later visit to the site by an unknown group, and provides a time frame for this unusual specimen.

Crypt Cave, near Winnemucca Lake, Nevada, yielded radiocarbon dates that paralleled those of Spirit Cave. Diamond plaited matting from Crypt Cave was dated at 9,120±60 years B.P. The Crypt Cave dog burial radiocarbon age determination was 6,360±60 years B.P. Diamond-plaited matting was also found in Grimes Burial Shelter, not far from Spirit Cave. It yielded an age of 9,470±60 years B.P.

The Wizards Beach skeleton was dated twice by our laboratory, with consistent results, but somewhat younger than the original date of 9,515±155 by Geochron

(GX19422-G). The UCR results are 9,250±60 and 9,200±60, which average to 9,225±60 (Tuohy and Dansie, Table 1, this volume).

This series of seventeen age determinations demonstrates the value of using AMS radiocarbon dating to reexamine existing museum collections with minimal damage or impact to the specimens. The remains from Spirit Cave were thought to be only 1,500 to 2,000 years old at the time of their discovery. Thus, for over half a century their value to archaeologists had gone unrecognized. Utilizing modern technology we are able to contribute a major new data set to the chronology of the western Great Basin. This provides the archaeologist with the opportunity to make fresh inferences about the prehistory of the area. Clearly, it is possible that existing museum collections may hold important answers to questions about our human past.

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PALEOPATHOLOGY OF THE WIZARDS BEACH MAN (AHUR 2023) AND THE SPIRIT CAVE MUMMY (AHUR 2064)

Heather Joy Hecht Edgar

In January of 1996 a study was made of remains from forty-nine individuals housed at the Nevada State Museum. Of these forty-nine, only forty-five are from the permanent collection and four were from a possible forensic investigation that turned out to be historic burials. The study included analysis of age, sex, morphometrics, and dental and osteopathology, as well as complete photo documentation.

This article is of narrow focus. It describes the pathological changes evidenced in the remains of two of the forty-nine individuals, AHUR 2023 and AHUR 2064, known as the Wizards Beach Man and the Spirit Cave Mummy, respectively. Although it is generally more informative to describe paleopathology in terms of an entire skeletal series (giving information about the over-all lifestyle of a group of people) the uniqueness of these two individuals warrants a complete, detailed description of the observable pathological changes. Indeed, the informational value of these remains is evidenced by the Twenty-fifth Great Basin Anthropological Conference, and dedicated to their analysis.

THE WIZARDS BEACH MAN FROM PYRAMID LAKE, NEVADA

Preservation

Analysis of AHUR 2023, the Wizards Beach Man, is complicated by the pattern of its burial. It may have been commingled with the remains of another burial, AHUR 2022. Dates for AHUR 2023 range from 9,200±60 (UCR-3445) to 9,515±155 (GX-19422G) years B.P. Ribs from AHUR 2022 dated at 5,905±125 (GX-19421-G). The age difference between these remains ranges between 3,370 and 3,800 years. Obviously, the two did not live contemporaneously. Both skeletons appear to be males, although this can be said securely about only one of them, as there is only one pelvis, the area of the body that provides the most reliable sexual indicators.

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Curation

A separation of the two individuals has been made. Fortunately, there is a duplication of all the bones assigned to AHUR 2023 in AHUR 2022, except for seven bones of the left hand. The only secure way to separate all the bones from the two individuals would be to date each one individually, thereby destroying, or at least limiting, their scientific value. For purposes of this analysis, the remains stored in the box labeled 2022 will be ignored, and the bones included under the number 2023 will be described as the Wizards Beach Man. The bones represented are a skull and mandible, one cervical vertebra, the left shoulder and arm complex, parts of the left hand, the right forearm, the left thigh, and the right lower leg.

Sex

While the lack of a preserved pelvic girdle makes definite sex assignment impossible, the skull, which is the second best sexual indicator, is masculine in form. A central ridge over the nose and eyes is pronounced, as are the mastoid processes, the bony protuberances behind the ears. The shape of the lower jaw is very masculine, with a square chin and flaring gonia, the angles of the jaw.

Age

The estimate of age in the Wizards Beach Man is based mainly on the amount of external cranial suture closure. During one's life, these sutures are obliterated at a fairly measurable rate. In most cases, the more obliteration of sutures observed on a skull, the older the individual was at the time of death. Application of this method produced an age in this individual of 32 years, with a standard deviation of 20-42 years. The wear of the teeth may indicate that this person was in the older part of this estimate, between 32 and 42 years. The lack of a complete skeleton prevents a more specific estimate.

Pathological Conditions

First, it should be mentioned that this description is based on the observable remains only. It may not fully describe all the disease processes the individual suffered. For example, only one vertebra is present. It is a cervical, or neck vertebra. Therefore, if 2023 had any lower back disease, it was not observable.

Osteopathology. This individual is very robust, with well marked muscle attachments throughout the preserved remains and especially at the shoulder. There is evidence of osteoarthritis at the left elbow and both wrists. Some of the joint surfaces show enlargement, porosities, and osteophytic bone growth, all signs of degenerative joint disease. These changes are not severe, but probably caused some discomfort.

New bone laid down by the periosteum, the sheath that covers all bones, is present on the left and right radii, the left femur, and the right tibia and fibula. The collateral lower limb bones are not observable. Some of the new bone is remodeled into fine striae paralleling the main axis of the bones, and some is newly applied and disorganized. Bone laid down on the cortex of long bones like this indicates a periosteal reaction to infection. The presence of remodeled as well as new bone indicates that the infection lasted for some duration and was active at the time of death. The infection is not necessarily in the affected bones, but is rather diffuse throughout the system. People can live with such infections for extended periods of time, so this may or may not give some indication of the cause of death.

Dental pathology. There are seventeen teeth observable, out of the total thirty-two in the average adult. The rest are either missing due to post mortem loss or are present, but broken. All the teeth present have heavy wear. Almost all the crowns are obliterated, so that the occlusal, or chewing, surface at the time of death was root stubs. This amount of wear is not uncommon for prehistoric specimens. There are no caries present, but this is associated with the heavy wear: In life, the teeth are worn too fast to allow caries to form. There is, however, one abscess on tooth number 30, the lower right first molar. This abscess was due to direct infection of the bone through the open pulp chamber of the tooth. Also associated with heavy wear, this condition, too, was common in prehistory, and it can be a cause of death.

THE SPIRIT CAVE MUMMY FROM THE FOOTHILLS OF THE STILLWATER RANGE NEAR FALLON, NEVADA

The dates on this individual range between 9,350±70 (UCR-3261-4) and 9,460 ±60 B P (UCR-3324-2). Its completeness, provenience, and associated artifacts give us an incredible opportunity to learn about the past in the Great Basin, and all of North America.

Preservation

The bones of this mummy were in excellent condition. Some observations were impeded by mummified tissue. To limit the destruction of the mummy, the bones of the exposed left arm were analyzed, but the embedded right arm was not exposed.

Sex

The pelvis is masculine, with narrow sciatic notches and subpubic concavities. The skull is somewhat masculine, with large mastoids and glabella, although the chin is pointed, a more feminine trait. Over-all, it can be said with assurance that these remains are those of a male, although not a very robust one.

Age

In the pelvis, age estimates were made using the pubic symphyses (the bony joint at the front of the pelvic girdle), and the auricular surfaces (which connect

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the pelvis to the spine). These figures were reinforced by examination of the external cranial suture closure. A consensus age of 45 ± 5 was reached. It should be noted that the observed dental wear seemed a little light for this age when compared to the over-all series of forty-nine analyzed in this study.

Pathological Conditions

Osteopathology. First, it is interesting that there is a general absence of osteoarthritis at joints in the appendages. While there may be some slight degeneration of the distal humerus at the left elbow, this seems to be the only degenerative joint disease outside the spine.

The spine itself, however, presents a very different picture. There are some genetic anomalies present that led to degenerative processes. The average person has thirty three vertebrae, seven cervical, twelve thoracic, five lumbar, five sacral, and four coccygeal. The Spirit Cave Mummy has thirty-four, the extra one being an atypical thirteenth thoracic. It has one rib present, although there may have been two with only one observable. Anomalies continue down the spinal column. The last lumbar vertebra, the fifth, looks on the left somewhat like the first sacral vertebra, the one below it. However, there are still five complete sacral elements. The fifth lumbar articulates with the left os coxa, or pelvic bone, an abnormal condition. The fifth lumbar also exhibits incipient spondylolysis at the left pars interarticularis. This is a stress fracture of the arch of the vertebra. The fracture is surrounded by osteophytic bone growth. In addition to these abnormalities, the superior sacral facets, the ones that join the sacrum to the spinal column above, are at irregular angles. The left facet is smaller and at a much flatter angle than the right. Over-all these variations led to instability in the spine, as evidenced by the spondylolysis of the fifth lumbar. Although these conditions were not life threatening, they certainly would have made day-to-day activities more uncomfortable.

One other major pathological condition will be described: a well healed fracture of the skull. The point of impact, though obscured by the dense bone associated with a healed fracture, can be described as being on the frontal bone, just anterior to the coronal suture, 30 mm left of bregma. There are two radiating fractures from the point of impact. The first is directed posteriorly for 35 mm. The second descends for 83 mm from the impact to the temporal suture. The amount of remodeling indicates that the individual lived at least for more than a year after the injury. The most common cause of this type of fracture is interpersonal violence. It is not possible to determine what type of object caused these fractures.

Dental pathology. All thirty two teeth are available for study, a rarity in prehistory. In addition to pathological analysis, morphometric observations were made, and are available on request. The anterior teeth show linear indentations, evidence that the teeth were used for processing sinew. There are three abscessed teeth, the

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upper right and left first molars (numbers 3 and 14) and the lower right 1st molar (number 30). It is likely that the infection related to these abscessed teeth led to the death of this individual.

Conclusion

AHUR 2023, Wizards Beach Man, lived around 9,225 years ago. He was a robust man, between 40 and 45 years old when he died. He suffered from mild osteoarthritis in his elbows and wrists, and had some sort of diffuse infection in his body. His teeth were very worn, and he had one abscessed molar, not atypical for a prehistoric man. Because of incomplete preservation, we cannot know all of the disease processes that may have affected his bones.

AHUR 2064, the Spirit Cave Mummy, lived about 9,400 years before the present. He lived to around the age of 45, and was not very robust or muscular. He had many genetic abnormalities of the spine that lead to some pathological changes and probably caused him quite a bit of lower back pain. However, he had little or no osteoarthritis in his arms or legs. Some time before his death the front of his head was fractured, possibly by the action of another person. He survived this injury, but may have died because of three severely abscessed teeth.