KENNEWICK MAN

The Scientific Investigation of an Ancient American Skeleton

Edited by Douglas W. Owsley *and* Richard L. Jantz

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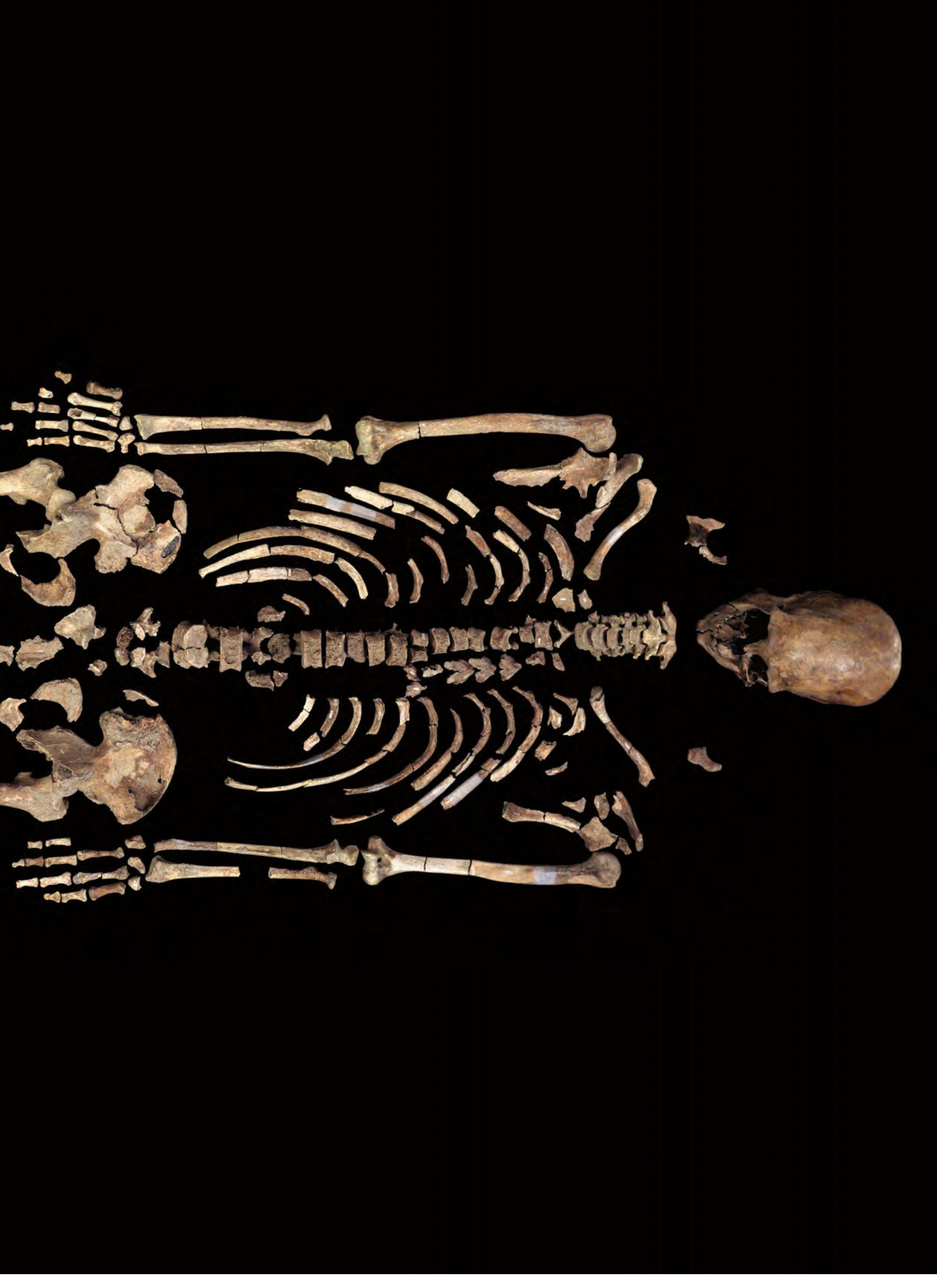

INTRODUCTION

The Scientific Investigation of Kennewick Man

Douglas W. Owsley

The study began with the discovery of about 300 bones and fragments of a skeleton whose skull spoke of uncertain ancestry and whose hip held a stone point. There were no other artifacts, not even a grave. Yet, with an understanding of how to interpret bones, investigators closely examined the fragments and reconstructed not only the individual's height, weight, and body build, but also his facial appearance. Among other details, information was gathered on his preferred foods, his main occupation, a description of his burial, and clues to his ancestors. This volume presents the results of the comprehensive scientific study of Kennewick Man, one of the most complete ancient human skeletons ever found in North America.

Although written for a rigorous, professional audience, the information, collected by experienced investigators in their fields, is structured in hopes of also reaching the interested, informed public. The chapters provide background and context, include detailed results and interpretations drawn from independent and interrelated skeletal investigations, and explain how the datasets were collected and analyzed, often within a comparative framework. Although the chapters are cross-referenced and coordinated, they were not designed to achieve correspondence on every assessment. As part of the scientific process, there can be varying interpretations; different points of view on the same data need to be presented with supporting arguments.

One point that is without debate is the rare opportunity Kennewick Man presents to learn about Paleoamericans and the conditions experienced during the early Holocene. While we may make inferences about the peopling of the Americas, the process of migration was far more complicated than appreciated even a decade ago. Recent work suggests that it began earlier than generally believed and involved movements from more than one homeland by both foot and watercraft. Human skeletal remains provide remarkable insights into this process, and bioarchaeology is one particularly informative means for investigating the past. There is still much to be learned. The contents of this volume, introduced in the following few pages, are intended to persuade others to advance the discussion, not to end it.

ESTABLISHING CONTEXT

Providing the reader with a context for Kennewick Man—both within the framework of Paleoamerican studies and this skeleton's discovery, curation, and analysis—is one goal of this volume. Lepper's review of the skeletal evidence from North America and Mexico points to the scarcity of data on late Pleistocene and early Holocene human remains. Summary burial and demographic information demonstrate that discoveries older than 8,000 radiocarbon years are not only rare but often incomplete due to recovery circumstances, poor preservation, or mortuary practices such as cremation. Lepper's chapter emphasizes the exceptional significance of the nearly complete skeleton of Kennewick Man. Chatters follows with a description of the discovery and provides an overview of how the bones were collected. Background information on the greater Columbia Basin, including its geography, hydrology, modern climate and ecology, geochronology, paleoecology, and human prehistory is also presented.

An accurate geologic age is crucial to sorting out the archaeological, cultural, and environmental contexts that form a basis for establishing Kennewick Man's contemporaries and for assessing whether he was different physically or behaviorally from them or subsequent groups. Stafford presents the chemical procedures used to purify the bone collagen, which in turn allowed for accurate dating of the remains. This process establishes the chronological foundation that places this paleoanthropological study within the context of time. Stafford's chemical analyses also provide a background for determining the effect of a marine diet on Kennewick Man's radiocarbon age.

An understanding of the circumstances of Kennewick Man's discovery and knowledge of his radiocarbon age set the stage for the legal battle over access to the remains (*Bonnichsen et al. v. US*), which was preceded by months of fruitless talks with the US Army Corps of Engineers (Corps), nearly six years in court, almost two years of an appeal that settled the case, and one year to prepare and obtain the Corps' approval of the study plan. Banks, a retired senior archaeologist with the Corps, offers a personal account of the agency's actions, which barred researchers from studying the skeleton. Attorneys Schneider and Barran describe case actions and decisions that eventually allowed scientific analyses. The lawsuit also involved clarification of the meaning of the words "Native American" and other key terms used in the Native American Graves Protection and Repatriation Act (NAGPRA). The District Court ruled that scientists have standing to challenge agencies' over-interpretation of NAGPRA. This decision has the potential to impact future interpretations of federal cultural resource laws including NAGPRA, the Archaeological Resources Protection Act, and the National Historic Preservation Act.

The curation history of the skeleton, beginning with its discovery in 1996 and ending with the plaintiffs' analyses at the Burke Museum in 2006, is presented by Hawkinson. Transfers of custody, repatriation requests, and detailed accounts of the plaintiffs' studies review the skeleton's recent history as well as efforts to secure the right to study the remains.

STUDYING SKELETAL EVIDENCE

The main objective of this volume is, of course, to present what has been learned about Kennewick Man as a result of scientific analyses. The varied, in-depth assessments of the skeleton reflect the study plan approved by the Corps and stem from two separate sessions for data collection, totaling only 16 days. During this time the many investigators, sharing the space and the bones, conducted their examinations and recorded data. Close and overlapping quarters resulted in information exchanges that led to new avenues of investigation, expanded sets of expert analyses, and an extraordinary number of photographs recording what was found.

An overview of the remains by Owsley et al. includes a complete bone and dental inventory and observations on bone morphology and pathology. It lays the foundation for subsequent chapters that focus on specific aspects of the skeleton.

Three chapters are devoted to research on Kennewick Man's dentition. Turner examines population affinity and the use of the teeth in task activities. Teaford and El Zaatari analyze patterns of enamel micro-wear related to food preparation and dietary contaminants. Hayes presents a clinical orthodontic assessment, comparing Kennewick Man's dentition to a modern population.

Bone structure, as it relates to body-build and activity patterns, is a recurring topic in several chapters. The body composition of Kennewick Man is discussed by Auerbach, who estimates stature and body mass and compares Kennewick Man to other Paleoamericans as well as to modern populations. Wescott examines external and computed tomography (CT)-derived cross-sectional properties of limb bones as a means of determining activity patterns. His biomechanical assessment compares the limb bones of Kennewick Man with late Pleistocene and Holocene groups involved in diverse subsistence strategies. The number of well-preserved hand and foot bones recovered provides an unprecedented opportunity to assess Kennewick Man's use of his hands and feet in everyday life. Case examines these small bones for asymmetry, developmental defects, and taphonomic changes, with handedness being among several conclusions.

Pathological changes and bone morphology are discussed by Chatters, who interprets patterns of traumatic injury and healing, changes in joint surfaces, and musculoskeletal markings as evidence of behavior. Cook also examines the skeleton for pathological changes. Despite congruence among some skeletal indicators of disability, her assessment differs in several respects from both Chatters and previous analyses conducted as part of the federal government's study team. Studies expressing multiple points of view are especially relevant in demonstrating the need for continued access to the remains for future analysis and interpretation.

The meticulous analytical methods used by Stafford were the basis for the carbon, nitrogen, oxygen, and phosphate isotope values reported by Schwarcz et al. Both chemical analyses chapters evaluate the implications of these findings and their interpretations with regard to the origin of Kennewick Man, an important topic revisited in the concluding chapter with the inclusion of additional food web and human comparative data. The chronological and isotopic investigations provide an increased understanding of how diagenesis changes original radiocarbon and stable isotope data and how accurate values can be obtained.

Three chapters focus on determining whether Kennewick Man was intentionally buried; they utilize information on bone preservation and the results of taphonomic assessment. This question was central to the analyses, but complicated by the recovery of scattered bones from the lake shoreline rather than the recovery of bones in situ. Evidence detailing the skeleton's original burial context is documented by Owsley et al., Norris and Owsley, and Berryman; it includes sediment deposition on Kennewick Man's bones, patterns of algal staining, and postmortem bone breakage. The first two contribute information on skeletal positioning and the length of time from exposure to recovery. The distribution and characteristics of postmortem breaks in the skeleton, and their sequence of occurrence, are used to further deduce in situ positioning and the erosion sequence. These complementary analyses demonstrate the potential for multiple lines of evidence to unravel postmortem history and provide a compelling model for taphonomic assessment of remains from disturbed contexts.

APPLYING TECHNOLOGY TO INTERPRETATION

Four chapters describe applications of emerging technologies to the Kennewick Man skeleton. Snyder explains how high-resolution, industrial-grade CT scans of the multiple pieces of the skull and right innominate were used to create stereolithographic resin models of each fragment. Hunt accepts the challenging task of assembling an accurate reconstruction of the original cranium and mandible using the translucent resin models. He describes the process of creating this proxy for the original skull, and with Jantz and Spradley, assesses the accuracy of the final model obtained by this laborious process. Over time, the photosensitive resins used to create the models described by Jabo will shrink. This instability requires the prototypes to be molded and cast in plaster, which can then be painted for visual fidelity. Virtual extraction and solid replication of the projectile point in the right ilium through CT analysis and rapid prototyping allows Stanford to describe damage to both the point's base and tip, and to tentatively identify the projectile point type. He stops short of definitively classifying the point due to limitations in viewing the actual object, but promotes the likelihood that an atlatl was used to inflict the wound. While these studies help to establish a precedence for other analyses, they also reveal limitations to their application and encourage future refinement.

INCORPORATING POPULATION DATA

Because cranial morphology is heritable and selectively neutral, it is useful for estimating the ancestral origins of unknown individuals. Craniometrics can therefore be used to test hypotheses about the peopling of the New World. In this volume, four chapters compare Kennewick Man's cranial measurements to data for Old and New World groups. Brace et al. evaluate the connection between Kennewick Man and the Paleolithic inhabitants of northeast Asia by comparing Kennewick Man to their worldwide database. This analysis examines the possibility that the Jōmon, presumed ancestors of the Ainu and direct descendants of the Paleolithic inhabitants of northeast Asia, represent a source from which the western hemisphere was initially settled. The variable set in Brace's database is focused primarily on measurements of the face and is smaller than that used by Jantz and Spradley, who identify a strong similarity between the cranial morphology of Kennewick Man and Polynesians. Spradley et al. apply two-dimensional geometric morphometrics to determine how Paleoamerican crania differ from Archaic period groups and late prehistoric/historic Native Americans. Visual appreciation of this variation is enhanced by wireframe models of crania obtained by connecting landmarks. Gill compares Kennewick Man to other populations using both metric and nonmetric approaches to the study of the skull and femur.

The translation of the results of the skeletal research to a broad audience is discussed in the chapter on the facial reconstruction of Kennewick Man. Forensic facial reconstruction methodology and anatomical artistry are combined by Bruwelheide and Owsley as they work to re-create Kennewick Man's appearance. Underlying bone structure determines the physical attributes of the head and face while the appearance of the eyes, lips, and hair were influenced by population attributes suggested by the morphometric comparisons. Personal characteristics, such as his age and tissue scarring from an injury to the forehead, were also factored into the finished bust. This reconstruction uses the results of the study plan's comprehensive analysis to achieve the most informed interpretation of his appearance.

LEARNING FROM EARLY HOLOCENE CONTEMPORARIES

Comparisons to other ancient human remains provide a frame of reference for interpreting data obtained from Kennewick Man. In this section, analysis of a ca. 10,000-year-old-skeleton from the coast of southeast Alaska by Dixon's research team exemplifies specific studies that need to be completed as part of a comprehensive study of Kennewick Man. This discovery from On Your Knees Cave includes geographical sourcing of lithic artifacts, offering insight into well-developed early Holocene trade networks or procurement strategies that required the use of watercraft. Isotope values for this man from the coast reflect dependence on marine resources and are similar to those of Kennewick Man.

Jodry and Owsley integrate information on skeletal morphology, burial setting, and associated mortuary items from a site in Texas to suggest that unique behavioral and social roles can be identified and that, unlike Kennewick Man, not all Paleoamerican males were engaged primarily in physical activities associated with hunting. This kind of analysis adds complexity and depth to Paleoamerican studies that have been primarily based on comparing lithic technologies. This chapter clearly demonstrates that continued access to ancient remains allows for new comparisons and reinterpretations of physical evidence.

ANTICIPATING KENNEWICK MAN'S FUTURE

The fate of Kennewick Man and the possibilities for future analyses are topics addressed near the end of the volume. Hawkinson raises concern about the long-term conservation of the skeleton at the Burke Museum based on ten years of data provided by the Corps. Politics and different cultural perspectives are also intimately tied to the fate of the remains, which without question represent one of North America's most significant bioarchaeological discoveries. The volume concludes with a synthesis of what has been revealed about Kennewick Man and identifies areas that still need to be investigated.

The study of this skeleton goes beyond a better understanding of a single individual from ancient America; through Kennewick Man, a greater appreciation for the complexity of the Paleoamerican story has also been acquired. The American public has shown a remarkable interest in the discovery, as well as in the scientific study of human remains, both modern and ancient. People of all ages want to learn more about this subject and to understand how information is collected from skeletal remains. In this regard, Kennewick Man has been the subject of numerous articles and books written for adults and younger readers. Kennewick Man has truly become a teacher for all ages.

On a final note, we have gained a greater appreciation for the different connotations and symbolic meanings one skeleton can have for present-day people. Kennewick Man has created a range of perspectives within and among groups internal and external to the court case, including employees of contributing federal agencies, other scientists, and Native American groups. The Kennewick Man discovery and analysis is a topic of passionate interest and debate within the field of anthropology, engendering support from some and criticism from others. Both positions were helpful. Critical commentaries helped us to better define our research objectives and clarify our analytical methodology. From long careers in physical anthropology, forensic anthropology and archaeology, we continue to be fascinated by this unparalleled opportunity to gain new knowledge. The contributors to this volume have learned a great deal about Paleoamerican life. We hope the reader does as well.

ESTABLISHING CONTEXT

Kennewick Man's significance is based on his context—within both the field of Paleoamerican studies and the court of law. His skeleton represents an invaluable source of information for this time period. Ancient skeletal remains are extremely rare in comparison to the thousands of later prehistoric and historic period skeletons. Most remains of comparable antiquity are incomplete with poor bone preservation—making the relatively complete and well-preserved skeleton of Kennewick Man that much more exceptional.

To fully understand the Kennewick Man story, it is crucial to also realize the significance of the skeleton within the context of the law. Through the Native American Graves Protection and Repatriation Act (NAGPRA), tribes were able to claim remains if they could establish a shared group relationship with the skeleton. Without confirming such a link through study, the US Army Corps of Engineers immediately decided to expeditiously repatriate Kennewick Man to tribes wanting to rebury him. The scientists, having had their many requests for access denied, felt that there was no way to prevent the loss of the skeleton except to file a lawsuit.

The results of the Kennewick Man case represent significant milestones in the interpretation of NAGPRA and the rights of scientists to study ancient remains.

The People Who Peopled America

1

Bradley T. Lepper

The story of the peopling of the Americas is about humans discovering and settling a truly New World. Curiously, archaeologists sometimes lose sight of the actual people involved, presumably because they so seldom encounter their physical remains. For example, Dillehay (2000:227) claimed that North and South America are "the only continents on the planet where our knowledge of an early human presence comes almost exclusively from traces of artifacts and not from human skeletal remains." Not surprisingly, perhaps, archaeologists tend to become obsessed with the elegant flint spear points and the bones of mammoth and giant bison among which they are sometimes found in lethal association. Yet, without diminishing the importance of the stones and animal bones upon which the understanding of the first Americans largely has been based (Adovasio 2003; Bonnichsen and Turnmire 1999; Dillehay 2000; Ubelaker 2006), it must be recognized that without the remains of the people themselves and the information contained in their bones, graves, and funerary offerings, the view is of a stage littered with fragments of scenery and discarded props, but with no actors.

Human skeletal remains of great antiquity are infrequently found in the Americas, but "frequency" is relative, and Dillehay (2000) has overstated the disparity between North America and the rest of the Paleolithic world. One survey of human remains from late Paleolithic Europe listed 56 individuals from the period between 15,000 and 10,000 years ago (Holt and Formicola 2008). Information is known on 74 sets of human remains from the same period in North America (Table 1.1). Europe has an area over 10 million square kilometers, whereas North America, including Canada, the United States, and Mexico, encompass about 22 million square kilometers. Therefore, in Europe there are about 5.6 documented sets of late Upper Paleolithic human remains per million square kilometers, and in North America there are about 3.4.

Clearly, the density of documented human remains is lower in North America, but since the documented European Upper Paleolithic human paleontological record encompasses about 2,000 more years than the equivalent record in North America, some of the discrepancy can be attributed to the accumulation of burials over those additional centuries. Moreover, the vastly greater extent of the late Pleistocene glaciation in North America relative to Europe meant that a greater proportion of its landmass would have been inaccessible to human occupation for much of this period. Finally, modern humans had entered Europe by perhaps 40,000 years ago, which means that by 15,000 years ago populations in many parts of Europe likely approached carrying capacity. In contrast, humans either were not yet present in the Americas, or had only recently arrived by 15,000 years ago, and it would be many centuries before population levels reached a density equivalent to that which characterized Europe at the beginning of this period. All of this suggests that human remains are not anomalously rare in the western hemisphere and that understanding of the earliest Americans is being hampered by the perception that such discoveries are rarer than they actually are.

Of course, none of this should be taken to suggest that Paleoamerican human remains are commonplace discoveries. On the contrary, human remains dating to this early period are, in absolute terms, quite rare. Although Table 1.1 lists a total of 324 possible burials, only 152 skeletons are sufficiently well preserved, complete, and adequately reported, even to be identified reliably as male or female. Many are so fragmented and incomplete that they fit comfortably in cupped hands.

One reason for the absolute, if not relative, rarity of ancient human remains is the long span of time over

TABLE 1.1 Paleoamerican human remains dated at least 8,000 RC yr. BP.

Date[1]	Site	MNI[2]	Age	Sex	Type of burial	Burial location	Grave offerings, number & type	Reference
13,270 ± 340 (SI-2488)	Meadowcroft, PA	1	—	—	accidental? firepit	rockshelter		Sciulli 1982
13,240 ± 1010 (SI-2065)	Meadowcroft, PA	1	—	—	accidental? firepit	rockshelter		Sciulli 1982
11,670 ± 60 (UCR-4000/ CAMS-87301)	Eva de Naharon, Tulum Caves, Mexico	1	20–30	F	unknown	cave	0	González González et al. 2008
10,960 ± 380 (CAMS-16810)	Arlington Springs, CA	1	adult	M	unknown	stream bank	0	Chawkins 2006; Dixon 1999; Johnson et al. 2002; Powell 2005:148
10,900 ± 300 (based on associated artifacts)	Fishbone Cave, Burial 2, NV	1	25–44	F	unknown	cave	5+; hide, basketry, cordage	Dixon 1999; Orr 1956; Powell 2005; Owsley pers. comm. 2010
10,755 ± 74 (OxA-10112)	Peñon III, Mexico	1	25	F	unknown	unknown	unknown	González et al. 2003; González-Jose et al. 2005; Powell 2005:154
10,705 ± 35 (CAMS-80538)	Anzick 1, MT	1	0.6–1	M	unknown	rockshelter	>100; lithics	Lahren and Bonnichsen 1974; Waters and Stafford 2007; Wilke et al. 1991; Morrow et al. 2006; Owsley and Hunt 2001; Stafford 1994; Owsley pers. comm. 2014; Waters pers. comm. 2014
10,625 ± 95 (Beta-43055/ ETH-7729)	Buhl, ID	1	17–21	F	shallow pit	gravel bar overlooking Snake River	4	Dixon 1999:126–128; Green et al. 1998; Herrmann et al. 2006
10,500	Chimalhuacán, Mexico	1	—	—	unknown	unknown	> 4	González-Jose et al. 2005
10,470 ± 490	Mostin 1978, CA	1	adult	F	—	eroding from creek bank	3; ground stone	Dixon 1999:128–129; Taylor et al. 1985:138
10,260 ± 340 (UCLA-1795A)	Mostin Burial 4, CA	1	—	—	—	eroding from creek bank	unknown	Dixon 1999
10,260 ± 190 (Gak-3998)	Warm Mineral Springs 1, FL	1	30–50	M	accidental?	sink hole	1	Clausen et al. 1975; Dixon 1999:138; Powell 2005:131
10,260 ± 190 (Gak-3998)	Warm Mineral Springs 2, FL	1	20–25	F	accidental?	sink hole	unknown	Powell 2005:131

(continued)

TABLE 1.1 (*continued*) Paleoamerican human remains dated at least 8,000 RC yr. BP.

Date[1]	Site	MNI[2]	Age	Sex	Type of burial	Burial location	Grave offerings, number & type	Reference
10,260 ± 190 (Gak-3998)	Warm Mineral Springs 3, FL	1	50+	F	accidental?	sink hole	unknown	Dixon 1999:138; Powell 2005:133
10,260 ± 190 (Gak-3998)	Warm Mineral Springs 4, FL	1	subadult	—	accidental?	sink hole	unknown	Powell 2005:131
10,200 ± 65 (OxA-10225)	Tlapacoya I, Mexico	1	30–35	M	—	sink hole	unknown	González et al. 2003
10,190 ± 1450 (TX-2595)	Little Salt Spring, FL	1	adult	M	—	sink hole	3+	Clausen et al. 1975; Clausen et al. 1979; Powell 2005:129; Wentz and Gifford 2007
10,020 ± 50 (CAMS-61133)	Arch Lake Woman, NM	1	17–19	F	extended in prepared burial pit	on dune crest overlooking Arch Lake basin	4: necklace (19 talc beads), unifacial stone tool, bone tool, pulverized red ochre (likely in pouch)	Owsley et al. 2010
c. 10,000	Crowfield, Ontario	1	—	—	cremation	small knoll along a gully	177 lithics; incl. 29 fluted bifaces	Deller and Ellis 1984
c. 10,000	Sloan, AR	30	—	—	extended?	prominent knoll on Crowley's Ridge overlooking Cache River valley	avg. 8 per burial; range: 1–38	Morse 1997
c. 10,000	Midland, TX	1	27–32	F	unknown, accidental?	—	0	Stewart 1955; Wormington 1957; Holliday 1997:101; Holliday and Meltzer 1996; Owsley pers. comm. 2010
10,000–8,200	Whitewater Draw 1, AZ	1	27–34	F	flexed	—	0	Waters 1986; Owsley pers. comm. 2010
10,000–8,000	Whitewater Draw 2, AZ	1	adult	—	unknown		0	Dixon 1999:139; Friends of America's Past 2001
10,000–5,000	Seminole Sink, TX	22	5–6	—	unknown—1 subadult cremation	small sink hole	unknown	Powell 2005:140–141

(*continued*)

TABLE 1.1 (*continued*) Paleoamerican human remains dated at least 8,000 RC yr. BP.

Date[1]	Site	MNI[2]	Age	Sex	Type of burial	Burial location	Grave offerings, number & type	Reference
9,710 ± 40 (CAMS-60681)	Horn Shelter 2 – A, TX (Tx-1722)	1	37–44	M	flexed, double	rockshelter	>10	Redder 1985; Redder and Fox 1988; Young 1988; Owsley pers. comm. 2010
9,690 ± 50 (CAMS-51794)	Horn Shelter 2 – B, TX (Tx-1722)	1	10–11	F	flexed, double	rockshelter	1+	Young 1988; Owsley pers. comm. 2010
9,975 ± 125 (AA-4805)	Olive Branch, IL	1	adult	F	cremation	floodplain	0	Gramly 2002; Bruwelheide and Owsley 2002
9,920 ± 250 (I-6897)	Tlapacoya XVIIIa, Mexico	1	adult	—	unknown	unknown	unknown	Dixon 1999:140; Lorenzo and Mi-rambell 1999; Gonzalez et al. 2003
9,880 ± 50 (CAMS-32038)	On Your Knees Cave, AK	1	20–22	M	accidental?	cave		Dixon 1999; Kemp et al. 2007; Ows-ley pers. comm. 2010
9,870 ± 50 (Beta-120802)	Marmes F 1, WA	1	15–20	F	cremation?	floodplain		Dixon 1999; Fryxell et al. 1968; Hicks 2004; Krantz 1979
9,870 ± 50 (Beta-120802)	Marmes F 2, WA	1	6	—	cremation?	floodplain		Dixon 1999; Fryxell et al. 1968; Hicks 2004; Krantz 1979
9,870 ± 50 (Beta-120802)	Marmes F 3, WA	1	15–25	M	cremation?	floodplain		Dixon 1999; Fryxell et al. 1968; Hicks 2004; Krantz 1979
9,870 ± 50 (Beta-120802)	Marmes F 4, WA	1	adult	—	cremation?	floodplain		Dixon 1999; Fryxell et al. 1968; Hicks 2004; Krantz 1979
9,870 ± 50 (Beta-120802)	Tlapacoya XVIIIb, Mexico	1	adult	—	cremation?	unknown	unknown	Dixon 1999:140; Gonzalez et al. 2003; Lorenzo and Mirambell 1999
9,700 ± 250 (GX-0530)	Gordon Creek, CO	1	30–34	F	flexed	arroyo bank	6; lithics, bone bead, red ochre	Breternitz et al. 1971; Dixon 1999:124–125; Powell 2005:151; Swedlund and Anderson 1999; Ows-ley pers. comm. 2010
9,700 ± 500 (M-130)	Graham Cave, MO	1	—	—	secondary	cave	5; point, hammerstone, antler tool, wolf canine pendant	Chapman 1975:97; Hoard et al., 2004; Logan 1952
9,670 ± 120	Cutler Ridge, FL	10	—	—	accidental? hearth	solution hole, rockshelter	NA	Dolzani 1986; Doran and Dickel 1988:371; Morrell 1997; Powell 2005:133

(*continued*)

TABLE 1.1 (*continued*) Paleoamerican human remains dated at least 8,000 RC yr. BP.

Date[1]	Site	MNI[2]	Age	Sex	Type of burial	Burial location	Grave offerings, number & type	Reference
9,650 ± 124 (Tx-4793)	Wilson-Leonard, TX	1	24–28	F	flexed	—	5; shark tooth fossil, groundstone chopper, hematite	Bousman et al. 2002; Collins 1998; Powell 2005:143; Owsley pers. comm. 2010
9,515 ± 155 (GX-19422-G)	Wizards Beach, NV	1	40–49	M	unknown	—	0	Edgar 1997; Tuohy and Dansie 1997; Owsley pers. comm. 2010
9,480 ± 160 (DIC-160)	Squaw Rockshelter, OH	2	25	1 F	unknown	rockshelter	0	Brose 1989; Prior 1989; cf. Prufer 2001
9,470 ± 60 (UCR-3477)	Grimes Shelter 1 (9F-NSM-743), NV	1	8–10	F	unknown	rockshelter	0	Dixon 1999; Powell and Neves 1998; Tuohy and Dansie 1997; Owsley pers. comm. 2010
9,470 ± 60 (UCR-3477)	Grimes Shelter 2, NV	1	16–18	M	unknown	rockshelter	0	Dansie 1997; Owsley pers. comm. 2010
c. 9,450–8,850	Ashworth 4, KY	1	adult	F	flexed	rockshelter	1; point (?)	DiBlasi 1981
c. 9,450–8,850	Ashworth 9, KY	1	—	—	unknown	rockshelter	0	DiBlasi 1981
9,435 ± 270 (GX-4126)	Ice House Bottom 1, TN	1	adult	F	secondary, shallow pit	rockshelter	2 mammal bones	Chapman 1977
9,430 ± 40 (Beta-120803)	Marmes H1, WA	1	adult	M	cremation? hearth	cave		Dixon 1999; Fryxell et al. 1968; Hicks 2004; Krantz 1979
9,430 ± 40 (Beta-120803)	Marmes H2, WA	1	adult	—	cremation? hearth	cave		Dixon 1999; Fryxell et al. 1968; Hicks 2004; Krantz 1979
9,430 ± 40 (Beta-120803)	Marmes H3, WA	1	adult	—	cremation? hearth	cave		Dixon 1999; Fryxell et al. 1968; Hicks 2004; Krantz 1979
9,430 ± 40 (Beta-120803)	Marmes H4, WA	1	8–14	—	cremation? hearth	cave		Dixon 1999; Fryxell et al. 1968; Hicks 2004; Krantz 1979
9,430 ± 40 (Be-ta-120803)	Marmes H5, WA	1	8–14	—	cremation? hearth	cave		Dixon 1999; Fryxell et al. 1968; Hicks 2004; Krantz 1979
9,430 ± 40 (Beta-120803)	Marmes H6, WA	1	8–14	—	cremation? hearth	cave		Dixon 1999; Fryxell et al. 1968; Hicks 2004; Krantz 1979
9,415 ± 25 (weighted mean of multiple dates)	Spirit Cave 2, NV	1	40–44	M	flexed	cave	3+; rabbit-skin blanket, moccasins, burial mats	Edgar 1997; Eiselt 1997; Jantz and Owsley 1997; Tuohy and Dansie 1997

(*continued*)

TABLE 1.1 (*continued*) Paleoamerican human remains dated at least 8,000 RC yr. BP.

Date[1]	Site	MNI[2]	Age	Sex	Type of burial	Burial location	Grave offerings, number & type	Reference
9,270 ± 60 (UCR-3480/ CAMS-30558)	Spirit Cave 1, NV	1	adult	F	unknown	cave	0	Tuohy and Dansie 1997
8790 ± 110 (NZA-1102)	Browns Valley, MN	1	32–36	M	pit	floodplain	lanceolate points	Anfinson 1997:32; Dixon 1999:120-121; Jenks 1934, 1937; Myster and O'Connell 1997; Powell 2005:136-7; Owsley pers. comm. 2010; Stafford pers. comm. 2010
9,040 ± 200 (UCLA-1795C)	Mostin, Burial 1, CA	1	—	—	unknown	eroding from stream bank	unknown	Dixon 1999
9,040 ± 50 (UCR-3478/ CAMS-30557)	Spirit Cave 3, NV	1	18–22	F	cremation	cave	0	Tuohy and Dansie 1997; Owsley pers. comm. 2010
c. 9,000–7,000	Cueva del Tecolote, Mexico	2	—	—	unknown	cave	1	González-Jose et al. 2005
c. 9,000–8,000	Jerger 3, IN	1	—	—	cremation	sand ridge over-looking marsh	>7; lithics, marine shell	Tomak 1979
c. 9,000–8,000	Jerger 9, IN	1			cremation	sand ridge over-looking marsh	>4; lithics	Tomak 1979
c. 9,000–8,000	Jerger 13, IN	1			cremation		>4; lithics	Tomak 1979
9,000	Metro Balderas, Mexico	1	—	—	unknown	—	unknown	González-Jose, et al. 2008
c. 9,000–8,000	Namu, BC	1	—	—	accidental?	sea coast at mouth of salmon spawning stream		Dixon 1999:119
9,000 ± 82 (UCLA-1292B)	Rancho La Brea, CA	1	16–17	F	accidental?	tar pit		Dixon 1999:130; Kroeber 1962; Powell 2005; Owsley pers. comm. 2010
8,965 ± 30 (UCIAMS-35589)	San Miguel Man (CA-SMI-608), CA	1	33–39	M	unknown	—	unknown	Owsley pers. comm. 2010; Stafford pers. comm. 2007
8,810 ± 250 (TX-6049)	Stigenwalt, KS	1	—	—	accidental?	—		Hoard et al. 2004; Thies 1990:109

(*continued*)

TABLE 1.1 (*continued*) Paleoamerican human remains dated at least 8,000 RC yr. BP.

Date[1]	Site	MNI[2]	Age	Sex	Type of burial	Burial location	Grave offerings, number & type	Reference
8,610 ± 90 (mean of multiple dates)	Anzick 2, MT	1	6–8	—	unknown	rockshelter	0	Morrow et al. 2006; Owsley and Hunt 2001; Stafford 1994; Waters and Stafford 2007
c. 8,500	Reiner, WI	1	—	—	cremation	—	Eden-Scottsbluff points	Mason and Irwin 1960
8,480 ± 390 (NMC-1216)	Cummins, Ontario	1	—	—	cremation	glacial beach	0	Dawson 1983; Julig 1984
8,480 ± 110 (ISGS-236)	Koster, IL	9	5 adult, 4 subadult	2 M, 3 F	adults: flexed; subadults: 3 extended; 1 flexed	floodplain	Only 1 male (Burial 80) had offering: bone atlatl weight?	Brown and Vierra 1983:107; Hoard et al. 2004; Walthall 1999:12
c. 8,450–7,750	Ice House Bottom 2, TN	1	35–40	F	secondary, cremated, shallow basin	rockshelter	0	Chapman 1977:113
8,358 ± 21(mean of two dates: UCIAMS-116396; UCIAMS-116397)	Kennewick Man, WA	1	35–39	M	extended	floodplain	0	Chapter 3
8690 ± 40 (CAMS-76640)	Chancellor 1, CA (pta 1812)	1	33–44	M	flexed double burial	—	0	Kennedy 1983; Owsley pers. comm. 2010
8,350 ± 90 8690 ± 40 (CAMS-76640)	Chancellor 2, CA (pta 1812)	1	40–54	F	flexed double burial	—	0	Kennedy 1983; Owsley pers. comm. 2010
8,250 ± 115 (S-1737)	Gore Creek, BC	1	23–39	M	flexed	wall of washout on Gore Creek	0	Cybulski et al. 1981; Dixon 1999:119
8,170 ± 100 (Beta-38554)	Hourglass Cave, CO	1	35–40	M	accidetal?	cave		Powell 2005:141
8,169 ± 488	Modoc 20, IL	1	35	M	semi-flexed	rockshelter	0	Fowler 1959; Neumann 1967
8,169 ± 488	Modoc 22, IL	1	13	F	flexed	rockshelter	0	Fowler 1959; Neumann 1967
8,169 ± 488	Modoc 25, IL	1	47	F	flexed	rockshelter	0	Fowler 1959; Neumann 1967
8,169 ± 488	Modoc 27, IL	1	45	F	flexed	rockshelter	0	Fowler 1959; Neumann 1967
8,169 ± 488	Modoc 28, IL	1	45–50	F	flexed	rockshelter	0	Fowler 1959; Neumann 1967
8,169 ± 488	Modoc 29, IL	1	47	M	flexed	rockshelter	0	Fowler 1959; Neumann 1967

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