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## **These Bones Are Read: The Science and Politics of Ancient Native America**

Arion T. Mayes

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# These Bones Are Read

*The Science and Politics of Ancient Native America*

ARION T. MAYES

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Nam et ipsa scientia potestas est [Knowledge is power].

Sir Francis Bacon

Over the water, the frozen sea, they went to enjoy it.

They went back to find where they had come across. They were not able to find it. The ice had melted. Then they were not able to go back for the others.

Anthony F. C. Wallace and William D. Reyburn, "Crossing the Ice:  
A Migration Legend of the Tuscarora Indians"

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At approximately 9,500 years old, two sets of human remains from La Jolla, California (W-12), known as the University House Burials due to the physical location of their discovery on property owned by the University of California, San Diego, are some of the oldest in the United States. These burials are central to a repatriation controversy between the University of California, San Diego, and the Kumeyaay Cultural Repatriation Committee, which represents twelve federally recognized Kumeyaay/Di-egeño tribal governments in San Diego County, California.

The story of the La Jolla burials is a politically complicated one involving the Kumeyaay Indian Tribe's efforts to claim and repatriate the La Jolla remains, the University of California, San Diego's property issues and scientific interests, the local community's concerns, federal law, and the question of the population origins of the La Jolla remains. This final point has become central to determining who should ultimately have control over the final disposition of the burials, a point that has

been, and will be, at the heart of many repatriation disputes. This article focuses on the science of determining the origins of all remains of great antiquity, including the La Jolla burials themselves.

Each Native American culture and nation has differing beliefs as to the treatment of human remains. Some are adamantly opposed to any kind of study of human remains, some are open to all types of study, and others fall somewhere in between, allowing scientific investigations that do not include invasive procedures such as DNA analysis.<sup>1</sup> Throughout the years many groups have actually changed their positions as they themselves seek answers to questions regarding their history. The Kumeyaay have, traditionally, been disinclined to scientific investigation of skeletal remains. In an effort to resolve a repatriation issue the Kumeyaay reversed their traditional stance, requesting that a noninvasive investigation of the burials be carried out by a bioarchaeologist at San Diego State University and a Kumeyaay graduate student.

This case study brings to the forefront a continual problem of miscommunication between tribal and scientific communities and allows for a discussion on the usefulness of osteological analysis for settling such disputes. Additionally, the case study presents evidence of physical characteristics often considered quintessential Native American traits and evidence of their presence in human remains in the Americas almost ten thousand years before the present. This critical fact would have been unknown if analysis of the remains had not been done. When the invitation to carry out the analysis of the University House remains was accepted by the bioarchaeologist at San Diego State University, it was understood that the goal was to document biological evidence, by noninvasive procedures, of population relationships. This analysis was based on collecting nonmetric data on dental and skeletal traits as well as skeletal morphology; metric data would be collected where possible. Any additional information that would be indicative of a population's biological history, such as disease patterns and occupational health, would also be documented. A surprising development during this process was the realization that, unlike in the past, where the charge was to determine if the remains were related to a specific *group* of Native Americans, the new challenge was to determine if they *were* Native American, an issue critically related to the current political controversy surrounding the subject of culturally unidentifiable human remains (CUHR).

The recently proposed changes to NAGPRA (Native American Graves

Protection and Repatriation Act) continue to polarize the anthropological and Native American communities as well as some within the scientific community. The current law dealing with the repatriation of Native American human remains and objects of cultural patrimony includes the phrase “of or relating to a tribe, people or culture that is indigenous to the United States” (NAGPRA PL 101-601). In 2004 a change was suggested that would alter the definition by adding in “or was” (“that is ‘or was’ indigenous”).<sup>2</sup> The proposed wording change as to the determination of when a group is deemed to be Native American is, of course, related to the continuing debate over who were the *first* Americans and what pre-European contact populations may have contributed to the genetic and cultural diversity we see in the indigenous populations of the Americas today. Additionally, other proposed changes by the Department of the Interior over guidelines for the disposition of CUHR are also entangled in this debate.<sup>3</sup> The disposition of Paleoindian and Archaic human remains has been at the forefront of many discussions, as these remains are often categorized as culturally unidentifiable. Many readers familiar with the decade-long controversy over Kennewick Man and debates over other long-held remains will think at first that these guideline changes relate directly to those cases.<sup>4</sup> In part, they may. But many remains of great antiquity have already been studied. And while the proposed NAGPRA changes may provide alternate options in terms of the disposition of previously studied human remains, the greatest effect will be on the unstudied or not yet known individuals. Adding fervor to the situation is the question of ownership of these remains. In what should have been a foreseeable development, the wording change has spurred some scientists to contest the “Indian-ness” of early Native Americans, thereby disputing any claim by modern groups for the ownership of said remains. Many of these challenges are based in theoretical perspectives and are presented without any true explanation to the general public of the interpretation of the data behind them. Science is a tool that should aid all those involved in any discussion, particularly those pertaining to the biological history of a people and population origins. There are important questions in terms of evolutionary relationships and migrations of modern world populations that ancient remains can aid in answering. An evolutionary perspective should engage Native Americans, investigating the commonalities among tribes as well as their relationship to other world groups. Additionally, an understanding beyond NAGPRA as to the bene-

fits of osteological analysis for a living population in terms of biomedical research is an important facet in working with tribes. If these points are not clear, it is because the scientific community has underestimated the general public and failed in expressing both theories and facts.

Participating in the science, or at least defining the questions at hand, would allow Native American communities the chance to level the playing field and answer for themselves inquiries regarding these early peoples. What makes us human? What makes us Native American? The Australian Aborigines can trace their lineage back almost fifty thousand years. Why let them have all the fun? As an evolutionary approach to the peopling of the New World continues, biological evidence may also lend further support to the many archaeological sites of greater antiquity in the New World. The dental, DNA, and craniometric studies point to Pacific coastal regions of both North and South American populations as the locations we should be investigating for answers to the earliest migrations. Not surprisingly, the archaeology has begun to point in that direction as well.

LEGAL ENTANGLEMENTS: CULTURALLY  
UNIDENTIFIABLE HUMAN REMAINS

As scientists, we affect the world around us in many ways about which we are both aware and unaware. The creators of the NAGPRA law operated on certain assumptions of “fact” regarding anthropological theories. The following passage has been used systematically for the past nineteen years to aid in the determination of human remains for repatriation and what items should be deemed objects of cultural patrimony. For the most part this law has been successful.

Section 5

(a) Each Federal agency and each museum which has possession or control over holdings or collections of Native American human remains and associated funerary objects shall compile an inventory of such items and, to the extent possible based on information possessed by such museum or Federal agency, identify the geographical and cultural affiliation of such item.

Such items to be used in determining cultural affiliation, when possible, by both the tribes and the federal agencies are “geographical, kinship, bi-

ological, archaeological, anthropological, linguistic, folkloric, oral traditional, historical, or other relevant information or expert opinion” (sec. 7[a][4]).<sup>5</sup>

One can only assume from events that have followed since the inception of this law that the authors were focused on human remains and material culture of a more recent origin, say, the last thousand years, and certainly many have interpreted it that way. Archaic and Paleoindian remains, however, have become a source of much controversy.<sup>6</sup> In recent years debates and propositions to change the wording of the NAGPRA law in terms of the definition of who is a Native American have ensued, with intense reactions by parties both in favor and against a wording change. These have been followed by suggested guidelines for the study and disposition of CUHR by the Department of the Interior, guidelines that have also elicited strong reactions by proponents for these changes but, especially, by those against it.<sup>7</sup> The scientific community would make better progress on the subject by dealing directly with the tribes themselves and separating its stance from political entities. The reality is, in terms of ancient remains, the law appears to be on the side of science. But science, a neutral entity interested only in empirical facts and quantifiable data, is not supposed to be on any one side.

#### HOW INDIAN IS INDIAN?

Whenever someone asks my dad if he is part Indian, he always says, “Which part?” In essence that is exactly what we scientists are doing: examining ancient remains for characteristics, or suites of morphological traits, that can be observed and identified in both modern world populations and ancient ones. An added benefit of osteological analysis for many is the biological history of a people being documented not just for the present but for the future. Understanding the natural history of a population can have both direct and indirect effects on biomedical research and public policy planning that is intended to support that living group.<sup>8</sup> Would knowing the biological history of a population at ten thousand years ago affect our approach to biomedical research now? The answer to this question is unknown. But we do know that there exists an evolutionary relationship between humans and certain diseases or pathogens.<sup>9</sup> Understanding the presence and pathways of these diseases in a population, however small, at one thousand, three thousand, and

even five thousand years ago could influence how we look at the genetic and biological history of that population's descendents. Following this same line of thought, it would stand to reason that anything older than five thousand years would also play an important role. The same should be true in terms of population variation as well. We can give a "legal" description as to when a child of time becomes an American, but only true scientific investigation on a region-by-region basis will be able to determine at what point we see true biological and historical shifts that may indicate possible ancestry or affect population health. But as scientists are placed in the awkward position of contributing to the legal definition of at what point a population "becomes" Native American in antiquity, many are unwittingly forced to fear the reaction of the living groups who would benefit the most from this knowledge.

In terms of population migration and debates related to the changes to NAGPRA regarding CUHR, questions to be asked are: When and how did humans arrive in the New World? At what point in time do we declare these ancient travelers to be Native American? And, while we have had positive results in identifying more recent cultural affiliations of older skeletal remains, can we, or will we, ever be able to identify the affiliations of the Ancient Ones? And do we need to? From an evolutionary standpoint it is important to investigate and record this history, but what of the approach? Native Americans by definition did not exist until they were in the Americas. Therefore, any founding populations are ancestral to what then became Native American people and cultures as we know them today. And while that may seem like a very simple concept, some researchers continue to present typological interpretations of data that imply that these early migrants were not ancestors of Native Americans. In truth, the science says much more.

#### CASE STUDY: LA JOLLA W-12

One of the most recent debates in California anthropology involves the two burials excavated in 1976 from the ocean-side cliffs of La Jolla, California, and referred to now as the University House Burials. Radiocarbon dating yielded an age of  $8350 \pm 90$  YBP (years before the present), calibrated to 8977–9603 YBP, making these Paleoindian remains some of the oldest in the United States.<sup>10</sup> Legally, these remains are owned by the University of California, San Diego, and were excavated from an area

that is now the chancellor's residence. However, in the years since their excavation the burials have resided in multiple locations. They have been stored at various institutions: the University of California, Los Angeles, the San Diego Museum of Man, and the National Museum of Natural History, Smithsonian Institution. The burials were then returned to San Diego, where they resided at San Diego State University in the Department of Anthropology before being transferred to the San Diego Archaeological Center, a location mutually agreed upon by the University of California, San Diego, and the Kumeyaay Cultural Repatriation Committee.

#### THE BURIALS

The shores of La Jolla include some of the most beautiful coastline in California, with beaches, cliffs, and estuaries. Spectacular in any century, these shores at almost ten thousand years ago would have been indescribable. The stories of these two burials of great antiquity have opened a window onto that past. Interred together in the cliffs of La Jolla, their proximity to one another certainly implies a relationship during life. What that relationship was may never be known. They were interred in one grave, head to toe, on their sides in a flexed position (knees up), one facing east, the other facing west.

The first individual, a young adult male in his mid- to late twenties, lived an active lifestyle. He was not a large man, but his overall appearance is that of a robust or strong man. He was right-handed, with prominent muscle attachments in the elbow and wrist area from a repetitive lock-and-thrust action, such as the use of an atlatl, or spear thrower, indicating that he was a hunter. His teeth are worn evenly, suggesting a high-protein diet.<sup>11</sup> A bony nodule located in the right ear, called an auditory exostosis, is a variation that is often observed in the skulls of individuals who have spent a considerable amount of time in cold water such as that of the Pacific coast.<sup>12</sup> Cause of death is unknown; however, there is clear evidence that he suffered from a chronic systemic infection, indicated by the pathological changes observed in his femur, tibia, and fibula (leg) and his humerus, radius, and ulna (arm), which show active, healing, and healed bone due to infection at the time of death.

His older companion, a female, in her late thirties to early forties, tells a somewhat different story. Her legs and arms are strong, with an empha-



sis on her upper arms carrying out repetitive behaviors. In addition to this are signs of occupational stress in the dentition. Her enamel crowns are completely worn down to the roots of the teeth, which, in turn, are polished and in some cases have observable striations across and down the exposed surfaces, very likely from some form of fiber strands having been pulled across the teeth. However, rather than having been worn in an even plane, the teeth are worn at odd angles opposite to one another, a pattern of occupational stress observed on the dentition that is often attributed to basket making.<sup>13</sup> This is not surprising, given the abundance of plant fiber in the coastal marshes. This older female shows little sign of infection. However, she has one unique trait, an unerupted, displaced incisor with a fused supernumerary tooth-bud. The shape of the fully developed impacted tooth is that of a prominent shovel-shape. This trait, considered by researchers as a quintessential Native American dental trait, is documented here as having been present in New World populations at almost ten thousand years before the present. These observations are not possible by the naked eye but were documented in 2008 through a CAT-scan image, a technology that was unavailable at the time of the discovery of the burials in 1976.

For both individuals, determination of age, sex, and pathology was carried out as well as documentation of morphological variation of non-metric traits of the dentition and skeleton, along with metric measurements of the crania and postcrania. Craniometric analysis was done, but, given the plastic distortion and postmortem breakage, many of the measurements were estimates, further supporting the decision to use a more reliable method of determination and description of population variation, the dentition. A previous study of these remains described the skulls as dolichocephalic in form (long and narrow) with “Polynesian” characteristics. However, a more recent study found the skull and facial morphology to have a variety of traits, including many used in forensic anthropology that would be termed “Asian” and/or “Native American,” and their overall appearance to be more generalized. Unfortunately, a final decision was made by the University of California, San Diego, prior to the submission of the final skeletal report, regarding classification. Currently, the La Jolla burials have been designated as culturally unidentifiable, with the suggestion that, due to their antiquity and appearance as described in previous studies, they may not be Native American and, therefore, cannot be claimed as such. So how does a tribal group approach such an argument?

Science relies on hypothesis testing, which is either supported or rejected. Testing of the hypothesis should reveal the facts, which either support or disprove ever-evolving theories. Textbooks are often slow to keep up with current research. This can lead to a lack of understanding by much of the public on one of the greatest debates in American anthropology since its inception: Who peopled the New World? This question has created fervor among anthropologists equal to that of a religious debate. But it is not a religious debate, it is a scientific one. What groups were responsible for the genetic and cultural diversity that we see throughout the Americas today?

Another important component for both the debate and newly proposed changes to the NAGPRA law is evidence of depth of time. Oral traditions of many Native Americans speak to a very distant past, which modern science is beginning to support.<sup>14</sup> And, as this investigation shows, the answers can be read in the bones.

### *The Biology of the Peopling of the Americas*

Recent studies suggest that previous theories as to the peopling of the New World were too simplistic and should be rejected in light of new data.<sup>15</sup> The Beringia model, or “Clovis first model,” states that founding populations from Siberia, following the big game animals, entered the New World approximately 11,000 YBP. They did so along the Bering Land Bridge and continued through an ice-free corridor into the interior of the continent. The evidence for this migration lies with the material culture left behind and the Clovis technology previously identified through archaeological investigations. This theory proposes that initial entry into the New World was later followed by at least two consecutive migrations. Since the 1960s questions regarding the Beringia model have been raised in the professional literature, advancing and retreating in waves of popularity.<sup>16</sup> Challenges to the Beringia model form the first point of discussion.

Many generations of researchers felt they had answered the questions, When was the first entry into the New World? By which route? But decades of archaeological, linguistic, skeletal, dental, and now genetic studies have raised new evidence indicating possible multiple waves of

modern humans, through alternating routes, having entered the Americas over the last twenty thousand years. As human skeletal remains of greater and greater antiquity have been found and analyzed, biology has added further information to the debate. First, many of these early archaeological sites have been greatly scrutinized as to whether they truly reflected the presence of early peoples.<sup>17</sup> But the identification of human remains at ancient sites provides definitive proof. Second, skeletal evidence provides valuable information as to the biological history of these early Americans. In addition to pathological analysis, which reveals patterns of diet, disease, trauma, and occupational stress, skeletal and dental morphological traits are recorded that may aid in population identification. This, too, has changed through the years as technology has advanced. Some techniques have been renewed as the comparative data sets have enlarged. Dental morphology, craniometrics, skeletal morphology, and genetic analysis have all been utilized. But what of the story they tell?

Given what we know about biology, the diversity seen in the Americas today can only result from the contributions of multiple populations or a single population over a significant period of time. Variation within that population could arise from genetic isolation, environment, natural processes such as genetic drift, and mutations. Even this may be too simple an explanation. Currently, due to the diligence of many, we are beginning to find answers to some of these questions. Most people, scientists and laypersons alike, are interested in determining at which point in human history it was possible for *Homo sapiens* to enter the New World. It would seem that our quest for the “who” is where researchers become polarized. Most researchers are now familiar with mitochondrial DNA (mtDNA), although they may not grasp its full implications for anthropology. Genetic research has gone through many stages, allowing for comparative studies with information gathered by other methods.

One such early comparison was performed by J. H. Greenberg and others in which linguistic, dental, and early genetic studies were analyzed for overlapping consistencies. The linguistic evidence suggests, according to Greenberg’s Amerind Language Hypothesis, that there are only three major New World language families, Amerind, Na-Dene, and Aleut-Eskimo, with entry into the Americas in their respective orders.<sup>18</sup> Dental morphology is highly genetically controlled and conservative in

nature. It is far less susceptible to external environmental conditions during development compared to other skeletal traits. This makes it extremely useful in comparisons of inter- and intrapopulation variation.<sup>19</sup> Twenty-eight dental traits were used to carry out distance analysis between the sample populations compared to other world populations in order to determine Native American origins. Four key observations were made: (1) statistically, New World populations clustered closer to one another than any other world populations; (2) among the New World samples, greater variation was recorded for northern groups as opposed to southern groups; (3) New World collections resembled Asian samples more than European; (4) “Aleut-Eskimos, Greater Northwest Coast Indians (Na-Dene), and all other Indians (macro-Indian) form three New World dental clusters.”<sup>20</sup> Additionally, the statistical evidence pointed to a specific region, Lena Basin of Siberia, as an exit point to the New World during the Late Pleistocene. The genetic data reviewed for this study were extensive and taken from numerous sources, but the types of research included

are serological in nature, involving blood-group antigens, serum proteins, erythrocyte enzymes, immunoglobulins, and leukocyte antigens. Additional genetic information came from restriction endonuclease analysis of mtDNA and from genetic epidemiological analysis of disease data associated with the New World Syndrome.<sup>21</sup>

Greenberg and colleagues synthesized and interpreted over two decades of genetic research only to conclude that, while many of the patterns were interesting, they in no way definitively matched the linguistic or the dental data. These patterns did not support the model of three migrations to the New World, which could account for a “tripartite division” of modern Native American populations, as suggested by linguistics. Recent studies have also refuted this model as well.<sup>22</sup>

While dentition’s genetic conservatism cannot aid in the question of time, it can assist in determination of population relationships through frequencies and degree of expression of dental structures. Suites of traits are recorded both individually and as a group. Distance analysis indicates which populations cluster close to one another (i.e., closer genetically) and which do not. This is based on the fact that dental traits, being genetically controlled, are passed down from one generation to the next,

with gene frequencies changing through time affected by such selective forces as gene flow, genetic drift, mutations, and population size.<sup>23</sup> From an evolutionary perspective, older (temporally) populations may have a particular trait(s) that is commonly identified in that population. However, depending on the aforementioned evolutionary mechanisms, these trait frequencies may shift, leaving a new pattern to be identified in modern populations.

Higher frequency of a dental trait and its greater expression indicate a higher frequency of the controlling allele in the overall gene pool and the likelihood that this trait will remain prominent in a population for a longer period of time. It therefore becomes an important descriptive identifier for that group. Shovel-shaped teeth are one such characteristic. Identified in several world populations, its highest frequency, both presence and prominence of form (expressivity), is documented in Native American populations. Most medical studies on the heritability of specific dental characteristics are carried out using modern living people. But with archaeological specimens we are able to “sample” through time and space and make generational comparisons. And while physiological disruptions during growth and development may affect a single tooth in a single individual, these disruptions do not change gene frequencies in a population’s gene pool. Richard Scott and Christy Turner point out that despite the dramatic environmental changes that founding populations in the New World would have been exposed to, current research shows that these changes would not have “significantly affected population trait frequencies.”<sup>24</sup> The only tooth crown available for analysis from the female of La Jolla W-12 has prominent shoveling, a characteristic still present in modern Native American populations.

It should not be disregarded that this trait has been documented in other populations in the world but at much lower occurrence rates. For instance, the prevalence of this trait has been categorized as present (but in very low frequencies, 0–15 percent) in populations in Sub-Saharan Africa and Western Eurasia. But in terms of peopling of the New World, Pacific populations can be divided into three major categories: Sunda-Pacific, Sahul-Pacific, and Sino-American. In terms of frequency and degree of expression of dental morphology, the Sunda-Pacific falls in the middle range, appearing to be more generalized; the Sahul-Pacific mirrors this but also has a higher degree of intergroup variation (heteroge-

neous); the Sino-American, which includes Native Americans, not only has the highest frequency of certain traits but the highest expression of them as well, such as shovel-shaped incisors (70–85 percent recorded) and double-shovel-shaped incisors; the subgroup of Native American populations has the highest numbers of all (90–100 percent).<sup>25</sup> Interestingly, the indigenous population of Japan, the Ainu, who are often physically compared to Paleoindian remains, was excluded. But more importantly, we are able to observe, based on macroscopic techniques, a pattern of generalized dental morphology involving two larger world populations. The third group, Sino-American, is identified with exaggerated frequencies and even derived dental traits for a large subgroup, American Indians. This pattern mirrors results of more recent genetic studies.<sup>26</sup>

Proponents of morphometric and craniometric studies have been at the forefront of an earlier entry hypothesis and, more specifically, of an alternate entry route, which involves a Pacific coastal migration into the New World.<sup>27</sup> Morphometric studies entail visual observations of skull morphology, strengthened by physical measurements of specific distances on the skull, to create two-dimensional and three-dimensional data of morphological variation that can then be evaluated using statistical analyses.<sup>28</sup> Anthropometrics have long been used in physical anthropology.<sup>29</sup> Craniometrics is a method widely employed in forensic analyses, aiding in the identification of known and missing persons by allowing further description as to the possible ancestry of a potential victim. Generally, categorizations are based on historical geographic information, but temporal classifications can take place as well. For instance, many early New World crania have been described as having a particular set, or range, of morphological variations, similar to that of modern Eurasians or Pacific Rim populations having “longer, narrower cranial vaults, shorter and narrower faces, with narrower and higher orbits than modern Native Americans.”<sup>30</sup> However, actual descriptions of many of these Paleoindian crania include all of the following adjectives: dolichocephalic-narrow vaults, large vaults, prognathism, large and small faces, robust faces, high faces, low, broad, and narrow noses.<sup>31</sup> We find this individual variation not only across sites but within them as well, thus supporting the view that early New World crania are generalized in nature in terms of skeletal morphology.<sup>32</sup> Therefore, craniometrics should be approached conservatively, since evolutionary selective forces may have unknown effects

on skull morphology. Additionally, cranial morphology can be heavily influenced by function during development.<sup>33</sup>

Richard Jantz and Douglas Owsley hypothesize that if the first migrants to the New World arrived via a coastal route, then early western North American human remains should be morphologically similar to early circumpacific Asian and modern Pacific populations. To test their hypothesis, the authors investigated five individuals from across California and found that “early Californians are highly variable, but in general are more similar to modern Pacific populations, such as Polynesians, than they are to modern Native Americans.”<sup>34</sup> The authors used two techniques for their analysis. First, they compared remains from California (Archaic to early Holocene), the western United States (early Holocene), and China (late Pleistocene) to modern populations. Next, they compared each of these Archaic remains to one another.

Jantz and Owsley state that in Walter A. Neves and Max Blum’s more recent analysis of the Buhl skeleton (early Holocene-Idaho), this individual is rather differentiated from modern Native Americans and Siberians in the direction of what Jantz and Owsley referred to as Polynesians. They also say that, “for whatever reason, they [Neves and Blum 2000] have chosen not to emphasize this aspect of their results.”<sup>35</sup> However, a review of Neves and Blum indicates that the Buhl individual clusters closest to the Eskimo sample and appears to be approximately equal distance from Native Americans and the Ainu of Japan, all of which, in turn, are closer statistically to the Buhl crania than other Pacific groups such as Easter Islanders.<sup>36</sup>

In 1928 an Indian anthropologist, P. C. Mahalanobis developed a generalized distance function, known as  $\Delta^2$ , which takes into account the co-variation of variables and produces a single number that reflects the distance between a single individual (unknown skull) and a sample of known skulls (collection), or the distance between samples of skulls.<sup>37</sup>

This is probably the best statistical technique now available for generating reliable distances using quantitative variables (i.e., craniometrics).<sup>38</sup> According to Rao, “Such a description, based only on measurements, quantitative or qualitative in character, may be of use in the study of evolution of the various groups.”<sup>39</sup> But Rao, who further refined this statistical technique, cautions us:

Although it is possible to refute any statement concerning the relationships of some groups, it cannot be asserted that any closeness as indicated by a study of measurements alone is due to some common stock from which the groups have evolved. Historical and ethnological evidence and also geographical contiguity of localities inhabited by various groups have to be considered in interpreting the observed differences.<sup>40</sup>

In discussing the Mahalanobis distance analysis, Jantz and Owsley interpret their results, stating that the California individuals have “decreasing similarity to Native Americans” while noting that they are “similar to East Asia, Ainu, and Polynesia.” They omitted to indicate, however, that the California individuals, based on craniometric data, cluster more closely to Native American populations and East Asian, followed by the Ainu and then Polynesian samples. Moreover, one could make the case from their analysis that the skulls of earliest California coastal individuals are more like East Asian and/or Polynesian, but, as time progresses up to La Jolla, they get closer and closer to Amerindians—a gradient through time. They also point out that the oldest California individual (in this study), La Brea, fell far away from modern Native Americans, where, in the Mahalanobis distance analysis, Native Americans were fifth in terms of population relationships. However, in the previous section Jantz and Owsley note that the La Brea individual from California “occupies an extreme positive position . . . on the two-dimensional principal coordinates plot showing relationships of recent human populations and early Californians.”<sup>41</sup> They thereby indicate (and one can observe by reading their figure 2) that La Brea does not cluster with any population, modern or ancient. Therefore, their statement that it doesn’t cluster with any modern Native American groups is misleading in this context. Additionally, the authors note that all of the California individuals represent a temporal span of five to six thousand years. Having considered all of the California samples as a single “population,” it is not surprising, given the length of time, that there is so much inter- and intravariation. A comparison that sampled individuals through time and included more recent Californians would have added clarification to this argument. The authors also propose that early crania from the western Americas should resemble Pacific Rim populations, as the “latter could represent source populations from which the earliest migrants were drawn.”<sup>42</sup> Sev-



eral studies discuss the generalized nature in both dental and skeletal morphology of Pleistocene human populations, particularly in Asia, and the subsequent changes that took place to those populations as they dispersed globally.<sup>43</sup> This has implications for the diversity observed in contemporary populations. Given the possibility of multiple migrations through differing routes and eventual gene flow, a hybridization allowing for further morphological variation is not unexpected. Comparing individuals from the same region through time allows one to observe the process, making distinctions less remarkable. Rao's warning should be heeded when interpreting data on craniometric evidence, particularly when making direct comparisons of ancient remains and modern populations such as those of La Jolla W-12.

### *Genetics and Anthropology*

In the mid-1980s a new method was invented that would revolutionize all genetic research: polymerase chain reaction (PCR). PCR utilizes an enzymatic reaction to take a strand of DNA as a template and replicate it. This means that a single or few copies of DNA can be exponentially amplified, creating literally millions of copies of the DNA. Variations on this basic theme allow DNA analysis to look for conserved or divergent regions of genetic material in populations. Mitochondrial DNA and the Y chromosome are especially useful in the study of human origins because, unlike other genetic material that undergoes rearrangement with every generation, mtDNA and the Y chromosome are passed down generation to generation intact with little change.

It is important to understand just how rapidly the technology has improved and its impact on the ever-expanding databases (such as the Human Genome Project) that are pertinent to all of the biological sciences and, specifically, to biological anthropology. New technologies have brought about faster and more reliable ways of determining "population relationships and genetic substructure of populations."<sup>44</sup> They have also allowed for more in-depth understanding of previously used systems through the identification of genetic mutations that change protein structures, such as blood group markers. It is by tracking these genetic changes that we are able to determine population similarities, differences, relationships, when and where populations diverged, and when marked changes took place. This gives us a depth of time, through muta-

tion rates, that has never before been achieved. It gives new meaning to the term *biological clock*.

Some mtDNA and chromosome studies indicate a very “early” entry into the Americas, 20,000–35,000 YBP.<sup>45</sup> More recent studies, however, give more conservative estimates (15,000–20,000 YBP) based on data culled from ancient remains themselves.<sup>46</sup> What they have in common is that all of the genetic studies reviewed in the following section point to an Asian origin for all Native Americans, with the understanding that Asian populations, like modern Native American populations, have gone through microevolutionary changes since the time of the last common ancestor as well as population movement. Most studies suggest that founding populations originated in geographic areas that “extended from the Altai Mountains to southeastern Siberia and northern China” with a possible Eurasian influence. The most recent and advanced studies point to a single migration of humans to the New World, with variation arising through isolation. Additionally, some lack of variation may have come from inbreeding of small founding populations, a barrier to gene flow.<sup>47</sup>

To reiterate the fact that genetics is a rapidly evolving field, within the last five years several studies have refined their analysis of the origins of current genetic diversity in indigenous New World populations as well as their estimated time of arrival on this continent. They also reflect a new era in which studies of ancient DNA can be used to test previous hypotheses based on modern DNA studies. The numbers of Paleoindian individuals viable for genetic research have been limited due to low numbers of samples compounded by skeletal deterioration, though some information remains available.<sup>48</sup> Teeth are the most successful source for the extraction of mtDNA for analysis due to the outer layer of the hard enamel, dentin, and the roots, which work as a natural protective encasing, ensuring better preservation of needed organic material. Bone fragments can potentially be used also, depending on the preservation.

It is unknown if the La Jolla W-12 individuals are viable for genetic testing, but they present an interesting situation. Due to their age they are relevant to such issues as the peopling of the New World and coastal migrations, as previously discussed. Their relationship to living populations is both historically significant and relevant in matters of repatriation. Finally, their potential relationship to one another is important. Their manner of interment implies that they were deliberately placed

together, but it does not tell us who they were to each other in life. Genetic testing may enable us to define a biosocial relationship. The female is older than the male. Mitochondrial DNA could aid in her identification. Is she his mother, his aunt, or his sister? Or is she someone else? The Kumeyaay at present are not interested in genetic analysis of the individuals from La Jolla W-12. But they do have questions regarding this type of analysis, as do many Native Americans. In particular, who were these first people, and what is their relationship to all Native Americans? Is it possible to establish direct links? Genetic studies attempting to answer both these questions have been and are taking place with other human remains.

The term *haplogroup* refers to a designation given to sets of genes that are always inherited together on specific chromosomes; these are identified using letters. Five haplogroups have been identified in the New World, A, B, C, D, and X.<sup>49</sup> Three out of five Native American haplogroups are found on both sides of the Bering Strait in Asia and the Americas (A, C, and D), while two are found in a variety of world populations (B and X).<sup>50</sup> Haplogroup B can be found in populations from East Asia, Central Asia, Southeast Asia, and Polynesian populations. This is important to note due to previous suggestions that many of the early American crania appear morphologically similar to Polynesian peoples. Additionally, the existence of this haplogroup in Polynesia and the Americas has been used as supporting evidence of a relationship. David Glenn Smith and colleagues state:

Although haplogroup B is known to have been in North America for at least 10,000 years, Polynesians with haplogroup B arrived in their current homeland approximately 3,500 year ago, much too late to have first introduced haplogroup B to the Americas. Moreover, the specific CR mutation that characterize the modern Polynesian motif of haplogroup B (e.g., the 16247G and 16261C transitions) are absent in the Americas. Hence, the common ancestry of New World and Old World members of haplogroup B must be very ancient indeed, long predating the settlement of the Americas.<sup>51</sup>

Haplogroup X has been identified in the Americas, Asia, and Europe and has added further speculation to some of the morphologic variations seen in some Native American crania.<sup>52</sup> However, like haplogroup B, the X haplogroup in Asian and European populations is missing mu-

tations found only in the New World groups, suggesting that, as with haplogroup B, the relationship is distant and predates migration into the New World.<sup>53</sup> In short, we can find Old World mutations in the New World, but we cannot find New World mutations in the Old World, except in the circumarctic region. A map can be drawn depicting population movement based on biochemical analysis. The data show that many changes to the populations of the New World that we see in modern populations today took place after they reached the New World and not prior to that time.

Currently, the oldest set of human remains in the New World (10,300 YBP), whose preservation has allowed for the extraction of Y-chromosome and mitochondrial DNA, is from On Your Knees Cave (OYKC), Prince of Wales Island, Alaska. Y-chromosome DNA screening was used to confirm that the young adult was a male. Mitochondrial DNA was used to determine the young male's haplotype and to test previously proposed theories of the mtDNA clock. Two tests, carried out independently, indicated that OYKC belonged to haplogroup D.<sup>54</sup> As discussed previously, haplogroup D is found in populations on either side of the Bering Strait. Its discovery in Alaska is not that surprising. However, its discovery in Alaska at 10,300 YBP marks the earliest known point at which this haplogroup, found today in modern Native American communities, entered the New World. Moreover, 10 percent of Native Americans who belong to haplogroup D also belong to the same subhaplogroup as OYKC and are found in "linguistically and geographically diverse populations distributed from Alaska to the southern tip of South America."<sup>55</sup> Lastly, using the OYKC mtDNA to recalibrate previous clocks, these data suggest that previous estimates were too generous both in the New World and, possibly, in other population studies. Based on findings from 10,300 YBP mtDNA, new estimates for the peopling of the Americas is less than 15,000 YBP. This is a conservative estimate based on the evidence at hand and parallels archaeological evidence as well. However, the data suggest that even a less conservative estimate would not be over 18,000 YBP at this time.<sup>56</sup>

Like Greenberg's study of more than twenty years ago, new interdisciplinary studies have been carried out for comparisons of morphometrics and recent genetic studies. The genetic studies lend overwhelming support to the hypothesis of a continuum of morphologic variants based on geomorphic data.<sup>57</sup> "Regional continuity of mtDNA haplogroup

frequency distributions occurs in the presence of marked discontinuity in craniometric features, suggesting an ancestral/descendant relationship between the younger brachycephalic [wide skull] and the older dolichocephalic [narrow skull] populations.<sup>58</sup> Furthermore, ancient remains whose cranial morphology differs from modern Native Americans were found through genetic testing to have haplogroups similar to modern Native American populations.

José González and colleagues performed morphometric analyses on 576 skulls ranging from the late Pleistocene/early Holocene up to modern groups and representing geographic regions both in the Old World (18 percent) and the New World (82 percent).<sup>59</sup> The Paleoindian individuals are from both North (n=6) and South (n=11) America. In the period around 12,000–18,000 YBP the path through the rich environment along the extended coastal margins south of the Bering land bridge was much less inhibited than the land route. This rich margin could have facilitated a coastal migration route much earlier than the land bridge.<sup>60</sup> The mtDNA evidence indicates a population expansion during this time. The archaeological evidence also supports that an expansion of human populations had begun to spread well into the Americas with evidence early on of cultural continuity, even inland. Confirmation from the interior route comes from complementary archaeological assemblages, the Ushki tradition on the Asian side of Beringia, and the Nenana tradition in Alaska at approximately 14,000 YBP.<sup>61</sup>

Gene flow across this region (circumarctic) and all the Americas must have taken place to some degree throughout pre- and post-European contact, with distinct Asian traits appearing later in time, just as distinct, derived traits arose in New World populations. Not surprisingly, this increase in variation parallels an increase in population size. Morphometric analyses indicated gradients of change across populations leading south through the Americas. González and others discuss how intermediate grades of morphological variation in previous studies have had little attention and maintain that cranial variation of Native American populations across time and space should be viewed on a continuum. The original founding population was diverse and generalized, both morphologically and genetically, and its descendent populations, affected by changing environments, produced variant characteristics and newly derived traits. This continuum is bookended by extremes of the form. Additional support is given to the hypothesis of coastal migration

by ancient Asian populations no earlier than 20,000 YBP, based on current available evidence.<sup>62</sup>

#### FINAL DISCUSSION

The University House Burials, at almost ten thousand years old, are currently some of the oldest in the United States. Excavated from the cliffs of La Jolla, California, they certainly represent the early coastal migrations or, at least, the descendents of those earliest founding populations. Isotope analysis indicated a heavily marine-based diet from the sea and estuaries.<sup>63</sup> Paleopathological analyses revealed definitive patterns of occupational stress, reflecting the sexually dimorphic role each individual played in his or her daily existence and subsistence.

As previously mentioned, the University of California, San Diego, has not had the La Jolla W-12 burials genetically tested. While the university works toward a positive resolution with the Kumeyaay, they have chosen not to carry out any invasive procedures. But, even if the skeletal remains were tested, there is no guarantee that they would be viable for the extraction of DNA. Their physical condition is delicate, compounded by excavation procedures that may have contaminated the bone further, as a protective resin was poured over the delicate bone in order to ensure better visual preservation. These remains were excavated before genetic testing became commonplace, and procedures were different. However, an examination of the dentition revealed a Sinodont dental pattern, particularly observable in the female, with an exaggerated shovel-shaped incisor of the Sino-American type.<sup>64</sup> So while we may never be able to determine the genetic makeup on a chemical level, the genetically conservative dentition has distinguishing dental traits that are characteristic of modern Native Americans today. There are many studies that show that the First Americans were generalized in cranial morphology, with gradients through time of various forms. Recent genetic studies, which many groups hesitate to employ, show relationships between Paleoindian remains and living Native American populations. This is an important factor in determining the descendents of First Nations.

That the stories of these ancient emissaries will be lost in the political entanglements of today is a great concern. The Kumeyaay have a connection to the University House Burials, possibly even a direct one. But, as the research cited in this article has demonstrated, at almost ten

thousand years old, the University House Burials are important to all Native Americans. As may be seen here, it is imperative to understand both sides of a debate and the reality that multiple types of evidence are crucial in any argument and helpful in discussions. Native peoples having a foundation in the science and methods involved will be able to participate in theoretical discussions and interpretations and to better advise their tribes, adding important elements to their written and oral histories. Such was the intention when the Kumeyaay, despite reservations, changed their position regarding skeletal analysis in this case. They sought to understand their past in a new way. And as the Kumeyaay and other tribes continue to engage in the process, they will have questions that allow all those involved to examine the evidence from a new and valid perspective.

#### NOTES

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