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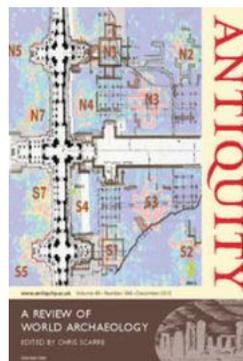
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Kennewick Man: coming to closure

David J. Meltzer*

Few human remains from the distant past have achieved the public visibility and notoriety of Kennewick Man (the Ancient One). Since his discovery in July 1996 in the state of Washington, he has appeared on one of America's best-known television news programmes, *60 Minutes*. He has been on the cover of *Time* magazine and in the pages of *People*, *Newsweek* and *The New York Times*. He has been the subject of popular press books (Downey 2000; Thomas 2000; Chatters 2001), and for many years running there were almost annual updates on his whereabouts and status in *Science* (some 30 in the decade following his discovery). That is saying nothing of the scholarly notice and debate he has drawn (e.g. Swedlund & Anderson 1999; Owsley & Jantz 2001; Steele & Powell 2002; Watkins 2004; Burke *et al.* 2008), including a recently issued tome marking the culmination of almost a decade of study (Owsley & Jantz 2014a).

As for the notoriety, Kennewick Man has been a poster-child for white supremacists. His reconstructed visage—which bears a startling, if entirely non-coincidental, resemblance to actor Patrick Stewart (the reconstruction was inspired by *Star Trek*)—appears on their websites as testimony that Europeans made it to the New World in Pleistocene times only to have been vanquished by later arrivals in the form of ancestral American Indians. (You will have to find their websites on your own: I will not give them the honour of a citation.)

Why all the attention? Embedded in Kennewick Man's pelvis was a stone-projectile point, and, based on the appearance of his cranium and the historic-period artefacts found nearby, the initial forensic assessment by James Chatters was "I've got a white guy with a stone point in him" (Egan 1996). This assessment was thrown into question when radiocarbon analysis showed that Kennewick Man dated to 8410±60 BP (Taylor *et al.* 1998). At a press conference to announce these results, Chatters drew attention to Kennewick Man's lack of resemblance to Native American appearance and pronounced him a 'Caucasoid', a centuries-old anthropological archaism that must be handled with care (or, better, not used at all), and is meant to convey the presence of morphological features reminiscent of European populations. It is also a word that was all too easily misheard by reporters as 'Caucasian'; one who had been stabbed from behind, during the Early Holocene, in North America. And so the controversy began.

Five Native American tribes who live in the region where Kennewick Man was discovered claimed him as ancestral. They deemed him the Ancient One, and requested of the US Army Corps of Engineers, in whose jurisdiction the find was made, that he be returned for reburial under the Native American Graves Protection and Repatriation Act (NAGPRA). The Corps

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agreed and posted their federally obligated notice to that effect. To prevent reburial from happening, eight archaeologists and physical anthropologists filed a lawsuit in 1996 against the federal government, arguing (among other things) that given Kennewick Man's antiquity and morphology, he was not necessarily Native American and therefore NAGPRA did not apply. They claimed the right under a variety of legal theories to conduct in-depth studies of the remains, arguing he was a "rare discovery of national and international significance that could shed considerable light on the origins of humanity in the Americas" (cited in Bruning 2006: 503).

In responding to the lawsuit, the US Department of the Interior (at the Corps' request) conducted a variety of historical and scientific studies (digitally archived at <http://www.nps.gov/archeology/kennewick/>) between 1998 and 2000 that aimed to document the remains, assess whether it was appropriate to consider Kennewick Man 'Native American' under NAGPRA and, if so, whether there was a 'cultural affiliation' between the remains and one or more of the American Indian tribes that claimed such a relationship (McManamon 2014). The Secretary of the Interior decided in 2000 that this was indeed the case, but his determination was rejected in US District Court.

Ultimately, the Kennewick Man case spanned eight years, cost several million dollars, involved two significant judicial decisions and ended with a legal ruling that hinged significantly (although not wholly) on verb tense. NAGPRA defines human remains as Native American if they are "of, or relating to, a tribe, people, or culture that *is* indigenous to the United States [emphasis added]" (NAGPRA 1990). The Secretary of the Interior had argued that in common parlance "the words 'is' and 'was' are appropriately used interchangeably when referring to tribes, peoples and cultures that existed in the past but are being spoken of in the present" (quoted in Bonnicksen *et al.* v. United States *et al.* 2004: 1597). The court disagreed, determining that as "Kennewick Man's remains are *so* old and the information about his era is *so* limited" one cannot "conclude reasonably that Kennewick Man shares special and significant genetic or cultural features with presently existing indigenous tribes, people, or cultures" (Bonnicksen *et al.* v. United States *et al.* 2004: 1608). They deemed Kennewick Man's remains "not Native American human remains within the meaning of NAGPRA" (Bonnicksen *et al.* v. United States *et al.* 2004: 1608; see also Bruning 2006). The plaintiffs won the right to study the remains. (For further details of the legal case and its implications see Watkins 2004; Bruning 2006; various papers in Burke *et al.* 2008; McManamon 2014; Schneider & Barran 2014; Hutterer 2015.)

Their study came to fruition in the fall of 2014 with a massive (*c.* 650 pages), detailed volume, *Kennewick Man: the scientific investigation of an ancient American skeleton* (Owsley & Jantz 2014b), that reported the results of what were highly productive investigations into Kennewick Man's anatomy, life history, burial and archaeological context. By all the evidence, his was a strenuous and, at times, hard life: he had been shot, after all, although whether deliberately or in a hunting accident was unclear (Cook 2014). He also had 5 or 6 broken ribs, a small depression in his left frontal bone (possibly the result of having been struck by a bola stone), as well as various lesions and other minor ills. Still, he had eaten well: isotopic evidence indicated a diet rich in salmon but also other river fish and perhaps birds (Schwarcz *et al.* 2014), even though it meant spending considerable time in cold water, which had caused an ear condition. Nonetheless, he had healed from his major

injuries and was a robust, right-handed, strong-limbed and broad-bodied individual (but with teeth worn down from a lifetime of overuse (Hayes 2014)), who died at around 40 years of age (Auerbach 2014; Owsley & Jantz 2014b). He was intentionally buried, his body placed parallel to the river, laid fully extended on his back, with his head pointed upstream and propped up slightly higher than his feet (Owsley *et al.* 2014: 324, 326, 349–50). Newly obtained radiocarbon ages, accounting for his isotopic signature and with a marine reservoir correction, put his death at *c.* 8500 years cal BP (Stafford 2014).

It was said of Kennewick Man that he was a traveller, a migrant from the Pacific Coast, and not a resident of the region of central Washington state where his skeleton was found (Owsley & Jantz 2014b: 624–25). That claim is primarily based on a speculative tale of who might have made and shot the point that ended up in Kennewick Man (Stanford 2014: 457–58), and a somewhat strained interpretation of the isotopic evidence, notably that his diet was based on marine mammals (in contradiction to the results presented in the isotopes chapter) (Owsley & Jantz 2014b: 627–30). And yet marine mammals also swam up the Columbia River to where Kennewick Man was found; he did not have to go to the coast (or be from there) to have hunted them. Furthermore, the traveller claim does raise the puzzling (if unanswerable) questions of why, if he was not from around there, he was so carefully interred, and who would have seen to his burial. Given the overall tenor of *Kennewick Man*, it is hard to shake the suspicion that calling him a traveller was done to create doubt that he was a resident of the area in which he was found and therefore had any descendants in the region.

As to whom Kennewick Man might be related, the answer in *Kennewick Man* differed by degree—but not in kind—from what had been claimed by Chatters more than a decade before. Kennewick was no longer Caucasoid, although one of the authors in the volume could not resist pointing to Kennewick Man’s very European jaw line (Gill 2014). Rather, various craniometric analyses pointed to similarities to Circum-Pacific populations, among them Polynesians, the ancient Jōmon, modern Ainu and the Moriori of the Chatham Islands, suggesting Kennewick shared ancestry with these groups (Brace *et al.* 2014; Jantz & Spradley 2014; Owsley & Jantz 2014b). Photographs of Ainu males, rather than images of “eastern and northeastern Asian populations historically classified as Mongoloid”, were used to create Kennewick Man’s new, post-Star Trek look (Bruwelheide & Owsley 2014: 524). There seemed no reason to use a Native American face model as Kennewick Man’s “large cranium and craniofacial morphology do not resemble present-day American Indians in this region, or even those from several thousand years ago” (Owsley & Jantz 2014b: 630).

What was not included in *Kennewick Man* was DNA analysis. Efforts to recover his DNA had been made in the late 1990s by several laboratories (<http://www.nps.gov/archeology/kennewick/>), but, given the technology available at the time, none of those efforts were successful. The principal authors of *Kennewick Man* were nonetheless aware that efforts at obtaining his DNA were by then underway at the laboratory of Eske Willerslev at the GeoGenetics Centre at the Natural History Museum of Denmark. That has since been published (Rasmussen *et al.* 2015; what follows is based largely on that report, of which I was a co-author). In what appears to be a pre-emptive shot across the bow, Owsley and Jantz announced that “Work in progress on Kennewick man’s DNA using residual samples may

be informative but are not ideal. Handling during previous government-sponsored testing may have resulted in contamination and, in general, thick cortical bone and teeth produce the best results” (Owsley & Jantz 2014b: 644–45).

Just so: there are exacting protocols that must be meticulously followed for extracting ancient DNA (aDNA) from bone—in the Kennewick Man case, a portion of his left third metacarpal that was used in prior attempts to recover aDNA (Rasmussen *et al.* 2015: supplementary information (SI)). These protocols are in place to ensure that the recovered DNA is endogenous and uncontaminated by modern handling.

Kennewick Man was not an ideal sample in terms of aDNA preservation (although the skeleton itself was well preserved). Nonetheless, genetic material was recovered and it had all the features of an ancient endogenous sample: the average size of the DNA fragments was 53.6 base pairs (bp), well within the customary range of an ancient specimen (fragmentation of DNA strands over time leads to fewer long (>100bp) fragments and many more short (<100bp) ones). The DNA damage patterns and contamination level (2.5%) were likewise well within normal for an ancient sample (Rasmussen *et al.* 2015: SI; see also Orlando *et al.* 2015).

The size of the sample and its preservation meant that the sequence coverage for Kennewick Man came to *c.* 1×. That is relatively low: it means each genomic position relative to the reference genome was read once on average, but because we were sampling randomly from DNA extract, this means some positions were not covered and others were covered more than once (for a discussion of sequence coverage and coverage depth see Sims *et al.* 2014). By way of comparison, the genome of the Anzick Child, a Clovis interment in Montana dated to 10 600 cal BP, yielded 14.4× sequence coverage (Rasmussen *et al.* 2014). Yet, as Pickrell and Reich recently observed, even levels of genome coverage on the order of 1–5% (or 0.01–0.05×) are “sufficient to support profound historical inferences” (Pickrell & Reich 2014: 385). Further, as part of the Kennewick Man DNA analysis, we also randomly subsampled the Anzick genome down to a level of sequence coverage comparable to Kennewick: even after doing so, Anzick’s population affinities remained essentially unchanged (Rasmussen *et al.* 2015: SI). The bottom line is that there is nothing to suggest that the aDNA genome sequence that was attained belonged to anyone but Kennewick Man, or that it would not reliably inform on his ancestry and affiliations (see also Rasmussen *et al.* 2015: SI).

Kennewick Man’s mtDNA, Y chromosome and genomic DNA were recovered, which by virtue of their distinctive inheritance pathways inform on different aspects of his ancestry. The uniparentally inherited mtDNA and Y chromosome DNA each independently trace back a single ancestral line (maternal and paternal, respectively), are susceptible to sex-biased demographic and cultural practices, and are prone to genetic drift and hence sampling bias (Pickrell & Reich 2014). In contrast, an individual’s autosomal genome sequence contains discrete DNA segments inherited from many thousands of ancestors (just how many depends on the generational distance from the individual, owing to the drumbeat of fragmentation of parental DNA by recombination, each generation adding about 65 new fragments (D. Reich, *pers. comm*)). A genome thus provides a record that is less vulnerable to lineage loss (it does occur but not as rapidly) and also less vulnerable to sampling bias. More importantly, the autosomal DNA of an individual yields many effectively independent genealogies and

so better represents the broader ancestral population (Stoneking & Krause 2011; Pickrell & Reich 2014).

It is conceivable that mtDNA, Y chromosome and genomic markers might yield different, possibly even conflicting histories for individuals in the same group, and might even tell different stories about the history of the same individual (this is why relying solely on uniparental markers to draw conclusions about the demographic history of the populations can potentially be misleading). In the case of Kennewick Man, however, the results were consistent across the markers.

Kennewick Man's mtDNA and Y chromosome haplogroups—X2a and Q-M3, respectively—are ones found almost exclusively among Native Americans. Not surprisingly for an individual of his antiquity, his mtDNA is not one of the derived (later) allelic forms of X2a (e.g. X2a1, X2a2), but rather is closer to the root of that haplogroup. Likewise, Kennewick Man's genome sequence is unequivocally Native American: direct comparisons with populations around the world, including sequences from the Ainu and Polynesians, demonstrate that Kennewick Man is significantly closer to other Native Americans than to any other group worldwide. Moreover, by Kennewick Man's time, Native Americans had already diverged into separate branches, presumably within North America, and he falls squarely on the branch whose descendants spread into Central and South America (Rasmussen *et al.* 2014, 2015). Kennewick Man was not among the very first Native Americans archaeologically speaking (current estimates put the arrival of people in the Americas at least *c.* 6000 years earlier, e.g. Dillehay *et al.* 2008), but he is deeply rooted in their genetic ancestry.

As to *which* contemporary Native American group(s) he is most closely related, we are limited by the small number of modern Native American genomes available for comparison (particularly among tribes of the United States). Of the Native American groups for which genome-wide data are available, the Colville, one of the five claimant tribes and the one that—despite Kennewick Man's long and contentious history—were nonetheless willing to provide DNA samples for comparison, are among the closest of his Native American descendants. That does not preclude the possibility that other Native American groups might one day prove to be closer, if their sequences become available. It would not, however, change the fact that the Colville are either direct descendants of the population to which Kennewick Man belonged or one to which he was very closely related, granting a bit of subsequent admixture (Rasmussen *et al.* 2015). Importantly, even with more modern samples for comparison, it will not change the broader (and relevant to NAGPRA) outcome: Kennewick Man is, and for that matter always was, a Native American.

Why, then, does his craniofacial appearance suggest otherwise? The answer comes down to sampling and representativeness. Kennewick Man is but a single isolated individual, and here sample size matters: little is known of the range of morphological variability within the population to which he belonged, or how well he fitted within that range (Hutterer 2015)—was he typical or representative of that population, or a morphological outlier? Comparing his morphological features with the mean values across a large population that is itself varied (of, say, Ainu or Polynesians), cannot reliably resolve whether Kennewick Man's apparent similarities to that population are historically meaningful or merely coincidental. In a test comparable to that conducted on the Anzick genome sequence, physical anthropologists

Christoph Zollikofer and Marcia Ponce de León of our group ‘subsamped’ individual known Native American crania, then compared their morphometrics with various population groups (including their own). The result: there was only a roughly one in four chance of successfully inferring their population affiliation (Rasmussen *et al.* 2015: SI tab. S5). It is therefore hard to accept the claim in this instance that “cranial morphology provides as much insight into population structure and affinity as genetic data” (Owsley & Jantz 2014a: 459).

As a group, early Native American crania seem to differ from those of modern Native Americans. Yet, that is not testimony that they were derived from a source population or migratory pulse separate from that of modern Native Americans. Craniometric variation is not solely a by-product of (separate) inheritance and history: mutation, isolation and drift, development and adaptation all converge to modify cranial form—and sometimes differentially its specific ‘modules’ (von Cramon-Taubadel 2014)—over evolutionary time and space, and therefore must be understood on a population level (Powell 2005; Roseman & Weaver 2007; von Cramon-Taubadel 2014; Rasmussen *et al.* 2015). Kennewick Man, and for that matter the population of which this individual was once a member, can all have had a distinctive craniofacial form, yet can all be Native American.

Genetically, Kennewick Man has been shown to be Native American, but it remains to be seen whether he will be recognised as such under law. Genetics falls under one of the ten types of evidence NAGPRA accepts in the determination of cultural affiliation between past and present and in decisions regarding repatriation (the evidence types are geographical, kinship, biological, archaeological, anthropological, linguistic, folkloric, oral traditional, historical, and other relevant information or expert opinion). Importantly, NAGPRA does not require scientific certainty to establish affiliation, but instead a preponderance of that evidence. Kennewick Man’s DNA would seem to shift the weight of evidence towards recognition of him both as a Native American and related, albeit at remove of 8500 years, to the Colville tribe of the Pacific Northwest. Ultimately, however, the determination of affiliation in this case is solely the responsibility of the Army Corps of Engineers. Kennewick Man’s future is theirs to decide.

What they will decide is yet to be seen, but from comments made by an Army Corps spokesperson to the media after the announcement of the DNA results, it is clear that they ‘don’t want to drag this out’ (Lawler 2015). They suggested a decision on the skeleton’s fate should come in months rather than years (Lawler 2015). One fact is absolutely certain, however: the five claimant tribes will call—indeed have already called—for the return of Kennewick Man’s remains for reburial.

Kennewick Man’s aDNA results were presented at a news conference in June 2015 at the Burke Museum on the University of Washington campus. The Ancient One himself was in the building (not on display but in a securely protected room), as was James Chatters (lending an awkward symmetry to the press conference in which he had announced Kennewick Man’s age and affiliation 19 years earlier). So too were representatives of the five claimant tribes, the Colville, Nez Perce, Umatilla, Wanapum and Yakama. Halfway into the press conference, as our discussion of the DNA evidence wound to an end, reporters turned to questions of what happens next, now that it was clear from the DNA evidence that Kennewick Man is Native American. These were not questions that were ours to

answer. One of the reporters then asked if any of the tribal representatives were willing to respond.

They were. Unplanned and unscripted, over the last half of the press conference, representatives of each of the claimant tribes stood to speak, deliberately and with steel in their voices. Kennewick Man, the Ancient One, was their ancestor. Full stop. The DNA merely confirmed what they had known all along: “We are him, he is us,” as Jim Boyd, Chairman of the Colville put it. Armand Minthorn of the Umatilla declared “We will rebury Kennewick Man (cf. <https://www.youtube.com/watch?v=Px-UQ3X8UvU>)”. He and others explained, sometimes in deeply personal terms, what his reburial would signify to the tribes.

We presented the DNA evidence. The tribal members gave it meaning.

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