MATERIAL CULTURAL CORRELATES OF THE ATHAPASKAN EXPANSION: A CROSS-DISCIPLINARY APPROACH

By

JOSEPH ANDREW PARK WILSON

A DISSERTATION PRESENTED TO THE GRADUATE SCHOOL
OF THE UNIVERSITY OF FLORIDA IN PARTIAL FULFILLMENT
OF THE REQUIREMENTS FOR THE DEGREE OF
DOCTOR OF PHILOSOPHY

UNIVERSITY OF FLORIDA

2011

To my life partner, Michelle Trim,
…without whom none of this would be possible

ACKNOWLEDGMENTS

I thank Peter Collings for his stellar mentorship, and John Moore, Ken Sassaman and Juliana Barr for their moral support and encouragement as the ideal members of my supervisory committee. I thank Victor Golla, Jack Ives, Roland Bohr, Jim Hamm and Don Dumond for helpful communication and permission to reproduce images. I thank many museum curators, collections managers, and staff for accommodating me, and apologize to those whose names I have forgotten. In chronological order of my fieldwork, I thank Kyle E. Bryner, Elise V. LeCompte, Michael H. Logan, Gerald R. Shroedel, Jefferson Chapman, Robert Pennington, anonymous and spouse, Kathryn Barr, Daniel Swan, Eric Singleton, Randy Ramer (to the last two names, special thanks for facilitating a visit on short notice), Patricia L. Nietfeld, Thomas E. Evans, Laila Williamson, Elise Alexander, Roger Colton, Gordon Ambrosino, Judy Thompson, Dawn Scher Thomae, Nancy O. Lurie, Karen Lacy, Natasha Johnson, Bradley Marshall, Brian Seymour, Yuri Berezkin, Kelly Fenn Sparks, Felicia Pickering, Michael Frank, Deni J. Seymour, David V. Hill, Kalinovskaya Ekaterina, Candace Sall, and Janaki Krishna.

I thank my spouse, Dr. Michelle Trim for encouraging me to apply to the University of Florida in the first place. I gratefully acknowledge the University of Florida for the provision of a four-year Alumni Fellowship, furnishing me the financial resources necessary to complete my degree on schedule. I thank the libraries (and particularly the interlibrary loan staff) at both the University of Florida and Elon University (NC), for providing me with invaluable assistance tracking down obscure publications. And finally I thank the folks at Google Books and the Internet Archive for their free public service and pioneering efforts of digitally archiving and making searchable many obscure ethnographic resources published during the last 150 years.

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LIST OF ABBREVIATIONS

AMNH	American Museum of Natural History; New York, New York
FENN	Private collection of Forrest Fenn; Santa Fe, New Mexico
FMNH	Field Museum of Natural History, Chicago, Illinois
GMA	Gilcrease Museum of the Americas, Tulsa, Oklahoma
MAC	University of Missouri Museum of Anthropology; Columbia, Missouri
MPM	Milwaukee Public Museum; Milwaukee, Wisconsin
NMAI	National Museum of the American Indian, Washington D.C.
NMNH	National Museum of Natural History, Washington D.C.
PAH	Pheobe A. Hearst Museum of Anthropology; Berkeley California
PGM	Peter the Great Museum of Anthropology & Ethnography; St Petersburg, Russia
RBCM	Royal British Columbia Museum; Vancouver, Canada
SDM	San Diego Museum of Man; San Diego, California
SNO	Sam Noble Oklahoma Museum of Natural History; Norman, Oklahoma
UFL	Florida Museum of Natural History; Gainesville, Florida
UMNH	Utah Museum of Natural History, Salt Lake City, Utah
UTK	Frank H. McClung Museum; Knoxville, Tennessee
WFU	Wake Forest University Museum of Anthropology, Winston-Salem, North Carolina
YPM	Yale Peabody Museum of Natural History; New Haven Connecticut

Abstract of Dissertation Presented to the Graduate School
of the University of Florida in Partial Fulfillment of the
Requirements for the Degree of Doctor of Philosophy

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By
Joseph Andrew Park Wilson

August 2011

Chair: Peter Collings
Major: Anthropology

Contrary to stereotypes of proto-Athapaskan culture as simplistic and archaic, evidence points to a sophisticated web of late prehistoric Asian-Athapaskan interactions. A holistic assessment of Athapaskan migrations in the context of the transpacific Dene-Yeneseian phylum (the largest, fastest pedestrian language spread on earth) sees Athapaskan-Asian connections (in language, technology, DNA, social organization, etc.) as reflecting profound large-scale cultural-historical processes whose implications have yet to be grasped.

Current understanding is that Athapaskans slowly migrated south in response to volcanic eruptions in southwest Yukon Territory after circa 200 and 800 CE. Yet problems remain, notably the archaeological invisibility of migrants on their long trek southward, and their possession of Asiatic strong complex bows which were not introduced to Northern Athapaskan territory until after these two eruptions. Linguistics, archaeology, biology, and data from ethnographic archery collections suggest Athapaskans carried sinew-backed bows to California and the Southwest. Both Apacheans and Northern Athapaskans uniquely possessed both ‘Arctic’- and ‘Plains’-style sinew-backed bows. Migration with retention (not diffusion through existing

populations) is the best explanation. The Athapaskan expansion was faster than generally supposed, quite similar to the contemporaneous Punuk/Thule Neo-Eskimo expansion in the far north. Such a model helps to explain archaeological invisibility in the intervening space, as the impact made by the migrants was small.

CHAPTER 1
INTRODUCTION

The Research Question

This study is an examination of western North American ethnographic materials from US museum collections, primarily sinew-backed bows. These materials are interpreted in the context of a four-field anthropological study of the expansion of the Athapaskan language family in western North America, in an effort to determine the role that material culture, particularly weapons technology, has played in this migration. Like many North American ethnonyms, "Athapaskan" is not actually an Athapaskan name, but is derived from an old Algonkian toponym, *athapaskaw,* "grassy place", used by the Cree to describe the Peace-Athabasca Delta, on the western shore of Lake Athabasca, in Chipewyan territory (Harrington 1940:506). Most (but not all) Athapaskan speakers refer to themselves by some variant of *Déné* the Athapaskan word for "people." My interest in questions of Athapaskan origins and migrations originates in a 24-week period of volunteer service with the Student Conservation Association in 1997-1998, when I worked in the Flagstaff Area National Monuments in northern Arizona. Although I worked on a variety of projects at three different monuments, most of my time was spent helping to monitor and stabilize sensitive backcountry archaeological sites and architectural features in and around Wupatki National Monument. Wupatki is located on the west bank of the Little Colorado River, adjacent to the Navajo Reservation, very near the Hopi Reservation, and surrounded on three sides by the Coconino National Forest.

I was then only vaguely aware of the story of the Athapaskan migrations into the Southwest, but I was soon exposed to several competing historical narratives, as older

academically-trained Anglo archaeologists and interpreters, together with younger more-or-less traditional Navajo and Hopi comrades engaged in spirited discussion of indigenous culture history in what is still a hotly contested geographic realm. I quickly learned of the great philosophical impasses between the Navajo and Hopi perspectives on Navajo origins. My Hopi colleagues were generally adamant that the Navajo were newcomers who had arrived only three or four centuries ago. My Navajo colleagues on the other hand were equally insistent that they had been there for twice that long or more, indeed for the better part of a millennium. Scholars too are sharply divided on these questions. Disagreement over the nature and timing of the Athapaskan migrations is longstanding, and forms part of the backdrop for other contentious issues such as the Navajo-Hopi land dispute (a bitter decades-old political disagreement over native settlements), which is another wedge issue for native communities and the anthropologists who work with them (Schwarz 1997; Washburn 1989). It is very often the case that anthropologists' and archaeologists' political sentiments reflect those of their particular indigenous collaborators; scholars of Hopi and/or Pueblo cultures advocate for Puebloan political viewpoints, and Navajo specialists advocate for the Navajo ones.

I seek to understand how and why the itinerant Navajo and Apache, originally from the far north, came to demographically overwhelm earlier southwestern Puebloan societies in a relatively short amount of time, despite an extreme difference in cultural ecology between the two regions. What could possibly have spurred the fastest known linguistic expansion of this scale in the Western Hemisphere, and why did it begin only during the last 2000 years or so, when there were no obvious barriers to population

movements for thousands of years prior? There is widespread agreement among scholars that the movement of Athapaskan speakers was primarily north to south and commenced during late prehistory, but that is about where the consensus ends. Considering the vast amount of scholarship which has been produced in an effort to address these questions there is a remarkable lack of concurrence regarding the precise chronology and how the migrations occurred (Matson and Magne 2007:138-149; Upham 1982:49). On the related question of why they occurred there is even less agreement.

In order to address the question of the timing of this expansion, there are several related questions that must also be considered. These questions will be addressed in the literature review (chapters two and three). First, as the Athapaskan expansion is a linguistically defined phenonmenon, so linguistic data must necessarily come to bear heavily upon the question of the timing and the source of the population movements involved. My assessment is that linguistic data is indeed consistent with a recent, rapid expansion. Second, human biology is another key area. As with the linguistic data, my interpretation of the genetic data is consistent with the rapid pace and late timing of the Athapaskan expansion. In particular, a number of genetic disorders which are specific to Athapaskan speakers indicate a series of recent genetic bottlenecks consistent with population founder effects and likely also a connection to Siberian populations in relatively recent timeframes (Erickson 2009). Third, a review of the archaeological literature is also consistent with the model of a recent, rapid expansion. All three of the above areas provide the context for a discussion of material cultural data collected in North American museums.

The Athapaskan expansion may be directly correlated to the late prehistoric diffusion of Asiatic sinew backed bow technology in western North America (Baldwin 1997; Downs 1972:6; Paper 1993). If it can be demonstrated to be valid, then this hypothesis represents a major piece of supporting evidence for a cultural connection between Athapaskans and Asians, as well as helping to explain how the Southern Athapaskans, initially few in number, were able so quickly to expand and encompass a vast territory occupied by others and far removed from their original homeland. My visits to ethnographic collections to examine North American sinew-backed bows were primarily conceived of to assess the material support for an Athapaskan role in the diffusion of complex archery technology. Complex bows made by Athapaskan speakers and their neighbors from all over western North America were closely compared to assess the interrelationship of bow technology with other ethnological data, providing information relevant to a discussion of Athapaskan migrations.

Cultural Evolutionary versus Historical Models

A language expansion of this speed and scale beginning from a nucleus in the remote Western Subarctic raises the question: how could a group of societies classed among the simplest in the hemisphere give rise to such a phenomenon? The answer is complicated. The extreme climates of interior northwestern Canada and Alaska demand versatility, efficiency and austerity in the face of unforgiving nature. Subarctic dwellers have demonstrated effective adaptation to changing resource patterns, favoring generalized subsistence strategies and correspondingly utilitarian toolkits. The dominant cultural-evolutionary model in anthropological theory since the mid-twentieth-century has often presented Northern Athapaskans and their neighbors as 'type-specimens' for pre-state hunter gatherer societies, and as direct analogs to much earlier

archaeological cultures in the region. But the evolutionary paradigm in North American ethnology is challenged by the late Holocene introduction of archery (presumably) from the Asian continent. John Blitz notes: “[i]n the popular stereotype, the bow and arrow is closely linked to the Native Americans, yet the archaeological evidence reveals a surprisingly shallow time depth” (Blitz 1988:123). Although the bow was ubiquitous throughout the Americas at European contact, it was virtually absent throughout most of both continents as late as the beginning of the Common Era. Yet Azar Gat is unconcerned by the impact of archery upon his cultural-evolutionary model for the emergence of violence in small-scale societies. His argument for the universality of “primitive warfare” requires independent confirmation in multiple independent small-scale societies, and Northwest America is taken as one of these test-cases.

> [T]he pattern of "primitive warfare" manifests itself independently everywhere. The . . . [bow and arrow’s] only effect was to increase the range of engagement even further. The American Northwest is another vast "laboratory" of "pure" hunter-gatherers (Gat 1999:567).

Gat cites nineteenth-century descriptions of Tlingit raids and feuds to support his model of warfare in simple societies. But these allegedly independent ethnological analogs for evolutionary theory are very weak. The accounts all well postdate the dramatic escalation of violence in these societies that ensued in the wake of the rise of the European fur trade. The northwest quadrant of the continent was already a protocolonial “theatre of power” by the mid-nineteenth-century (Harris 1995:131). Further, many of the basic assumptions underlying the cultural-evolutionary view of “primitive warfare” in the Northwest have been severely challenged by the revisionist approach to hunter-gatherer studies. As Kenneth Sassaman succinctly points out:

> the evolutionary validity of ethnographic hunter-gatherers has been fully undermined by historical insights on the connections between these

> presumed "pristine primitives" and the food-producing societies and nation-states in which they are encapsulated (Guenther 1996; Headland and Reid 1989). With this revisionist thinking, archaeologists lost the authority to blithely use ethnographic observations for analogical purposes, but they gained an arsenal of concepts for interpreting hunter-gatherer variation and change in historical, as opposed to evolutionary, terms. . . . This revised way of thinking is informed by theories and paradigms that we can gloss as "historical" (Sassaman 2010:4-5).

Consistent with this revisionist paradigm is the rapid pace of the adoption of archery technology observed by archaeologists. This does not support the recently prevalent cultural evolutionary models for the adoption of new technology by Native Americans. John Blitz further argues.

> The large-scale pattern of dispersal and adoption reveals processes not directly attributable to local environmental circumstances. Instead, the rapid dissemination of the bow across major ecological boundaries is interpreted as the result of a contagious competitive advantage in intergroup conflict (Blitz 1988:124).

Yet despite the recent advances of revisionist (or historicist) scholarship, subarctic cultures such as the Athapaskans are still widely regarded as relicts of prehistory, rather than as historical actors engaged with a wider world. Headland and Reid (1989:49) regard subarctic peoples as geographically isolated and therefore as "possible exceptions" to the rule of widespread late Holocene engagement in interethnic trade between hunter gatherers and their neighbors. This study will help to demonstrate that the Athapaskan expansion during late Prehistory is far from exceptional, but could arguably be a type case for the historicist position.

Athapaskan-Asian Connections

While in Arizona I also became aware of apparent strong cultural affinities between American Indians and East Central Asians (particularly Athapaskans, Tibetans and Mongolians), and of ongoing intercultural exchanges between indigenous peoples

of Asia and southwestern North America (Gold 1994; Meredith 2002). As James Downs notes "[p]ersons who have associated with both Athapaskan, particularly Navajo and Apache, and Central Asian peoples such as Mongolians and Tibetans have often remarked at similarities of attitude and general behavior" (Downs 1972:6). While some of these similarities can be observed in Native Americans in general owing to remote common origins, I could not help but wonder if there was a stronger historical connection at play in the Southern Athapaskan case, because the number and nature of similarities struck me as more than would reasonably expect by chance after millennia of separation. For example, my curiosity was piqued upon learning traditional Navajo weavers will incorporate a single deliberate error in each piece, made to symbolize human imperfection in the face of divine perfection (Carmean 2002:xx; Villaseñor 1963:46). The identical practice and identical justification for this practice is found among Altaic weavers in Central Asia (Mellaart 1980:93). Navajo cultural delegates to Tibet have lately remarked on the incredible similarity between specific Navajo and Tibetan woolen blanket and hat designs, along with the common personal names shared between the members of the two groups, physical appearance and manner of prayer (Norton-McBride 2003). One such coincidence is unremarkable, but there are very many of them. And they often relate practices (like weaving) which were presumably developed long after the time when the First Americans left Asia.

Delving into the old anthropological literature for Athapaskan-Tibetan language links, a field pioneered by an earlier generation of eminent linguists like Edward Sapir (1925, 1991), Morris Swadesh (1952) and Robert Shafer (1952, 1957), I learned that additional Central Asian languages, particularly Yeniseian, are considered in this

context by such scholars as John Bengtson (Blažek and Bengtson 1995), Merritt Ruhlen (1998), Michael Fortescue (1998) and more recently by Edward Vajda (2010a, 2010b). Beyond the linguistic evidence, there are a number of anthropological studies that address the profound similarity between Navajo and Tibetan religion (Chiao 1982; Karnakova 1913; Klein 1983; Krippner 1997; Samuels 1995).

Ethnographic Evidence

Lidscha Arbakow, an Alaska Native elder, Vietnam war veteran, PhD candidate, and fluent Athapaskan speaker told me "[m]y ancestors sailed across the Bering Sea from Asia" (Wilson 2005:68). I soon discovered a large corpus of Athapaskan oral traditions recorded over the past century, each making explicit claims to the people's cultural roots in Asia. For example, the origin narrative of the Navajo *Tsi'najinii* ("black streaked wood") clan says that the Navajo people originated in the Old World across the Pacific Ocean, and that overpopulation eventually forced them to emigrate to the New World (Weisiger 2004:253). Donald Cole (1988) records "a story that was old a century ago" among the Southern Chiricahua. This tale maintains that the Apaches were originally the slaves of Central Asian horticulturalists who rode horses and used bows and arrows. "Legend told of a revolt and flight to the east through dark forests and across water larger than any river. Having left the Old World and entered a New World, the people moved east and south" (Cole 1988:2). Some educated Chiricahua even go so far as to claim that their former Asian residence was Xinjiang, in the heart of East Central Asia (Cole 1981:11). Virtually all the eighteenth and nineteenth-century records of Northern Athapaskan oral tradition make similar explicit claims for Asian origins in a time of great strife and warfare. Alexander Mackenzie's journal from 1793 mentions:

> the Chepewyans, and the numerous tribes who speak their language. . . . Their progress is Easterly, and, according to their own traditions, they came from Siberia; agreeing in dress and manner with the people now found upon the coast of Asia (Mackenzie 1902: v.2, 353).

The Asian homeland of the Athapaskan Chipewyan, in the account recorded by Mackenzie, was a place "where they suffered great misery" at the hands of "a very wicked people"; upon their arrival in America, the Chipewyan told Mackenzie they soon disovered and settled upon Coppermine River where they were able to immediately make use of the abundant native copper resources (Mackenzie 1902: v.1, clxxiii). Asian-origin stories are found in Athapaskan folklore all over Canada, from the Rocky Mountains to the Mackenzie River Delta. Most versions are similar to the contemporary Alaskan and southwestern accounts cited above, describing distant homelands on a western continent with numerous people and exotic animals, where the ancestral Athapaskans were forced by their ferocious enemies to flee the continent and move to North America (Morice 1914:148-150). The explorers who recorded these stories often took them at face-value, as testimony of a major migration from Asia in the relatively recent past. In contrast, later nineteenth and twentieth-century anthropologists of a cultural-evolutionary persuasion have been skeptical of such accounts, casting aspersions on their veracity:

> Most of these accounts seem to be in accord in placing their earlier home far to the west, either across the sea or on the other side of a long lake full of islands. From this western land they were driven by the cruelty and fierceness of their neighbors, and after long travel and many difficulties came into their historical habitat. . . . The most that may be said is that attempts to derive the northern Athapascans from Asia on the basis of these traditions are absurd (Swanton and Dixon 1914:399-400).

The work of Alice B. Kehoe (1981, 2003, 2010) questions the wisdom above. This basic Asian migration narrative has been reiterated independently at least half a dozen

times by closely related peoples residing thousands of miles apart. This should give one pause before assuming that these accounts are purely mythological and have no historical value. Kehoe (2010:200-201) maintains that anthropologists over the past century have disregarded the importance of pre-Columbian trans-oceanic voyages in favor of a paleontological (natural-science based) model of American cultural-evolution. Widespread Athapaskan oral traditions describing a journey from Asia by boat are incompatible with this paradigm, and have been dismissed as fanciful mythology for the better part of a century.

Some Athapaskan tales of flight from persecution in Asia appear to have been forgotten by the peoples who once reported them. For example, in the 1860s, Emile Petitot recorded in great detail Hare and Gwich'in Athapaskan accounts of migrations of persecuted ancestors across the western ocean from "the continent we have left" (Petitot 1878:50). But contemporary Gwich'in elders seem to have forgotten these tales, and may alternatively claim autochthonous origins in North America (Kari 2010:218). Some indigenous activists now assert that transoceanic migration stories undermine native land claims; their views resonate with those of like-minded anthropologists. But native intellectuals are divided on the merits of this approach, just as scholars are. The late Vine Deloria argued that ancient America harbored shiploads of refugees from historical conflicts. His statements echo the details of the old Athapaskan accounts.

> [M]any people feel they cannot advocate Precolumbian contact for to do so would mean demeaning the Indians and suggesting that they could not have made discoveries on their own. Strangely this debate also rages in Indian circles, and a few of my best friends are adamant about maintaining the theory of isolation in order to enhance the achievements of our ancestors. . . . Unpleasant though it may be to some Indians, we need to know the truth about North American prehistory, and indeed that of the Western Hemisphere. I personally feel that unless and until we are in some

> way connected with world history as early peoples, perhaps even as refugees from Old World turmoils and persecutions, we will never be accorded full humanity. We cannot be primitive peoples who were suddenly discovered half a millennium ago (Deloria 1992:597).

The Structure of the Study

The next two chapters constitute a large cross-disciplinary review of relevant scholarship (including linguistics, genetics, ethnology and archaeology). Chapter 2 is a historical summary of more than a century of Athapaskan studies in anthropology, focusing on conventional wisdom in the field. Chapter 3 brings this picture up to date with a review of recent work, especially breakthrough linguistic and molecular genetic studies. Some of these newer studies pose distinct challenges. A recently forged linguistic consensus surrounds the Dene-Yeniseian language family, meaning that the existence of Central Asian cultural ties with Athapaskans (and also their Eyak and Tlingit relatives) has left the realm of speculation, and must now be directly confronted by non-linguists. Chapter 4 describes the methods employed—what exactly I did, which museums I visited, which bows and other objects I examined, how measurements were recorded and which ones, and why. Chapter 5 describes the findings based on my observations and field data, including representative tables of results grouped by culture area and/or language group, and explanations of the categories in tables. Chapter 6 explores the broader significance of this study; what the findings mean and what the results point to in regards to the research question; the conclusion, addressing the contribution of the present work to the larger field of study, and suggesting the next steps for further research.

CHAPTER 2
THE HISTORY OF ATHAPASKAN STUDIES

The Linguistic Foundations

Since 'Athapaskan' is foremost a linguistic classification, the field of historical linguistics necessarily forms the framework through which all non-linguistic data are interpreted. Athapaskan is the largest family within the Na-Dene linguistic stock. The stock was formally proposed and named by Franz Boas' student Edward Sapir (1915), although Michael Krauss notes that this proposal has much earlier roots. He traces the development of the hypothesis from the eighteenth century onward, particularly through nineteenth-century Russian literature (Adelung and Vater 1816; Radloff 1857; Wrangell 1839:101-103, 259; see Krauss 1973:953-954;1964:127-128). Na-Dene is the largest and most widespread of the generally accepted American Indian language-groupings. Of the four proposed genetic units within Na-Dene, three of them (Haida, Tlingit and Eyak) are single languages almost exclusively confined to the Northwest Coast, while the largest, Athapaskan, is a widespread group of very closely related languages almost exclusively limited to the continental interior.

The precise number of Athapaskan languages is difficult to determine, because broad dialect continua and mutual intelligibility between so-called 'languages' are commonplace. Doubts about the validity of the Na-Dene phylum and the inclusion of both Haida and Tlingit persisted for many decades (Krauss and Golla 1981:67). Sapir's mentor, Franz Boas did not accept the validity of Na-Dene as a whole, although he did consider Tlingit-Haida to be a genetic grouping (Boas 1894). He thought Tlingit-Haida was unrelated to Athapaskan but convergent with Athapaskan due to diffusion and borrowing as a result of historical contact (Swadesh 1951). Boas' views were shared by

Goddard (1920). These questions have remained open. Some have harbored doubts about even Tlingit until fairly recently (Campbell 1997:286), while others still embrace 'Na-Dene' according to Sapir's original usage, including both Tlingit and Haida (Dürr and Renner 1995; Enrico 2004; Pinnow 1985; Ruhlen 1998). Most Americanists now occupy a middle ground, rejecting Haida, while affirming the affiliation of Tlingit. They have thus split apart Boas' old 'Tlingit-Haida' unit which was widely accepted by an earlier generation of linguists, regardless of where they stood on the 'Na-Dene' issue (Hymes 1956:626-632).

'Na-Dene' is now most commonly used to describe only the relationship between Athapaskan, Eyak and Tlingit (or 'AET'; excluding Haida). Eyak refers to small native culture closely related to Athapaskan, once residing in the Copper River Delta. The relationship between Athapaskan and Eyak is so close in fact that the distinct status of the Eyak branch was recognized by Anglo-Americans only in the mid-twentieth-century, when Eyak language and culture were already severely endangered (Birket-Smith and de Laguna 1938). Athapaskan and Eyak together form one major sub-unit of Na-Dene, 'Athapaskan-Eyak' (the other being simply Tlingit). In recent centuries the Eyak were largely absorbed and assimilated by the northwesternmost Tlingit who have steadily encroached upon their territory (de Laguna 1990). Eyak language is now extinct, as the last native speaker died in 2008. So the only living Na-Dene languages remaining are a number of Athapaskan languages and Tlingit (and possibly Haida).

Michael Krauss speculates that Tlingit itself may be a "hybrid" language resulting from the merger of an early Athapaskan-Eyak speech community with an unknown, unrelated group (Krauss 1973:960-963). This would account for the paradox of Tlingit's

remarkably Athapaskan-like verbal morphology, despite fewer than expected lexical cognates (in other words the stem-inventory of Tlingit could reflect a distinct strand of non-Athapaskan-Eyak genetic history). If the unrelated stock was indigenous to the region and a bona fide Na-Dene linguistic stratum was later introduced by immigrants, then the Tlingit's coastal adaptation and material culture could have been borrowed en masse along with the associated foreign lexicon, as the arrivals were integrated into a community with deep roots in the region. It might be that this non-Na-Dene component was a relative of Haida, and that Tlingit is genetically related (by mixed marriage) to *both* Haida *and* Athapaskan-Eyak. An artificially more-ancient 'Na-Dene' follows in two different ways: (1) through an illusion of continuity with stable local archaeological traditions, and (2) because hybridization has accelerated Tlingit's linguistic divergence from kindred interior-dwelling Athapaskans.

Na-Dene and Sino-Tibetan

Linguistic claims for Athapaskan cultural roots in Central Asia are nearly as old as the field of Na-Dene historical linguistics itself. The earliest published reference to a possible link between Athapaskan and Tibetan languages was made around 1876 by the Catholic missionary and ethnologist, Father Émile Petitot, who was a fluent speaker of multiple Canadian Athapaskan languages. In a chance meeting with a missionary returning from Tibet (l'Abbé Fage), both clerics were astonished to discover several common vocabulary words in addition to numerous structural and grammatical similarities shared by Tibetan and Athapaskan languages (Petitot 1878:61). Later, Edward Sapir, his student Morris Swadesh and the eminent Sino-Tibetanist Robert Shafer among others have sought to establish a transpacific stock, joining Na-Dene with Sino-Tibetan, and forming the 'Sino-Dene' or 'Dene-Tibetan' grouping (Sapir 1925,

1991; Shafer 1952, 1957; Swadesh 1952). Sapir wrote that “the similarity in feeling between Tibetan and Nadene is at least as close as between Latin and English, probably closer” (Sapir 1991:134). Sapir’s work incudes Haida in this phylum, but Shafer subscribed to a more conservative approach, excluding Haida and including only Athapaskan and Sino-Tibetan materials. The great bulk of evidence for Sino-Dene language links comes from Athapaskan and Tibeto-Burman languages. The fact that Sapir’s work was yet unpublished when Shafer did his work is significant, according to Sapir’s student Morris Swadesh, who writes that “Shafer's work constitutes an independent corroboration of the correctness of the theory” (Swadesh 1952:178). Sapir and Shafer are considered to be the ‘founding fathers’ of Na-Dene and Sino-Tibetan linguistics respectively, but their disciples have been generally unreceptive (even highly critical) towards efforts to bridge the gulf between geographically distant families (Kaye 1992).

Some linguists have nonetheless proposed an even larger Dene-Sino-Caucasian ‘super-stock,’ combining Na-Dene, Sino-Tibetan, Yeniseian, and Caucasian (Blažek and Bengtson 1995; Sarostin 1991). The Dene-Caucasian proposal, though rooted in Sapir’s work, relies heavily upon the unconventional multilateralist comparative method, a.k.a. mass comparison, pioneered by Joseph Greenberg (Greenberg 1987), and furthered by his protégé Ruhlen, John Bengtson, and others. Mass comparison is not recognized as a valid method by the majority of Americanist linguists. However, Sapir’s original Sino-Dene proposal did not use unconventional methods. Whatever its merits may be, Sino-Dene is “argued on the basis of the traditional comparative method and . . . subject to refutation on the same basis” (Michalove et al. 1998:468).

Timing the Athapaskan Expansion using Lexicostatistics or Glottochronology

Chronological estimates for language divergence are based on lexicostatistics, extrapolated to a timeframe known as glottochronology. Morris Swadesh's (1951) classic article "Diffusional Cumulation and Archaic Residue as Historical Explanations" is recognized as a foundational text in anthropological linguistics because it establishes the ground-rules. Swadesh's basic premise is widely accepted. Each language possesses a stable core vocabulary. Some of these core words are nevertheless lost through time. Core word lists can be compared across languages to reveal words of common origin (cognates). A uniform rate of change in core vocabulary between two related language-communities would (in theory) allow one to date the temporal divergence of the two populations, by calibrating the loss rate for related languages of known historical depth. In possibly the earliest effort to establish the time of divergence between different Na-Dene languages, Swadesh compared 82 core-words for Tlingit and Athapaskan, finding 36 (44%) cognates and thus proposed that the most-recent common ancestor of Tlingit and Athapaskan was at least 2000 years ago (Swadesh 1954:362). Since that time, other scholars have adjusted the method and increased that age estimate, but the basic method has remained the same.

It has long been assumed that the Na-Dene languages diverged gradually, more-or-less *in situ,* in early Holocene North America (Greenberg et al. 1986). This is not a valid assumption, as members of distinct yet related languages often migrate together. One needs only to look at the recent colonial expansions of closely related Indo-European languages (e.g. Spanish and Portugese, or English and Dutch) to see this is the case. Indigenous North America has other examples of this phenomenon; notably, the late expansion of Uto-Aztecan speakers in the Great Basin most likely involved

several distinct, closely affiliated languages (Miller 1986:100-104). Individual languages with a common pedigree can be completely differentiated long *before* a shared migration event brings them together to a new home. As Kenneth Weiss and Ellen Woolford argue:

> the distance between the . . . Na-Dene groups could not be used to date the divergence of this group in the New World . . . since if there was pressure on one group to migrate, there could as well have been pressure on two nearby groups to move at about the same time (1986:492).

Or as Richard Perry succinctly put it "[o]n the basis of present evidence, for that matter, there is no compelling reason to assume that the division between Eyak and Athapaskan occurred in North America at all" (Perry 1983:720). Even assuming that the depth of divergence between Na-Dene languages would conform approximately to migration history, the estimation of linguistic divergence rates is an inexact science fraught with difficulties distorting its conclusions; "linguistic data are quite compatible with any date" (Nettle 1999:3328). As a relative dating method, glottochronology must be 'calibrated' using non-linguistic data. The next sections will review the chronological estimates of the Athapaskan migrations, based on linguistic evidence.

The North-South Direction of the Athapaskan Expansion

Edward Sapir (1936) described two types of linguistic evidence for Athapaskan migrations; 'internal' evidence refers to specific lexemes having remote, identifiable origins, and/or neologisms reflecting relatively recent adaptations to new surroundings. 'External' evidence includes the patterning, diversity, and depth of differentiation ('cleavage') between dialects or languages, which may also hint at the direction and relative order of migrations. The northern *urheimat* (linguistic homeland) or nucleus of the Athapaskans is demonstrated based on both types of evidence; there is more

linguistic diversity and dialect cleavage in the north than in within either the Apachean or Pacific Coast branch, and there is a clear pattern of neologisms related to southwestern foodstuffs and horticultural products (Sapir 1936: 224-225). Furthermore, the cleavage between individual Northern Athapaskan and Southern (or Pacific Coast) Athapaskan languages (e.g. Navajo and Chipewyan) is not as great as that between particular Northern languages, (in other words Dena'ina and Chipewyan). This establishes the north as the more ancient language-bloc and the two southern blocs as peripheral.

Sapir presented internal linguistic evidence which conclusively proved the recent northern origin of the Navajo; e.g. the Navajo word for corn or maize, *nà˙dą˙'*, now the most sacred plant in the Navajo cosmos, originally meant "alien-food" or "food of the enemy" (Sapir 1936:231). It less well known that a remarkably similar plant-name construction, made from the same '*na*' root-word (for "enemy," "alien," or "foreigner"), is found in the language of the Chilcotin, in the southernmost contiguous extension of the nuclear Northern Athapaskan bloc, and can likewise be used to demonstrate a southward migration, as reported by A.G. Morice: "They call the particular kind of grass *(Poa tenuifolia)* known as bunch-grass, which is one of the most valued possessions of their present country, *Œnna-t'lâ,* which means 'grass of the Foreigners', that is the Shushwaps" (Morice 1914:153). Further, the Athapaskan names for a row of hills in the Great Bear Lake basin are arranged in a geospatial-chronological template following a northwest-to-southeast migration itinerary, with "First Promontory" being the northernmost one, and "Last Mountain" and "Last Steppe" respectively being the southernmost two (Morice 1914:154).

While the primary movements have been north to south, there have been other migrations back and forth between the three major geographic blocs. The nineteenth-century witnessed the annihilation of tens of thousands of California natives in massacres and through disease in the wake of white settlement, and the Pacific Coast Athapaskan groups were not spared (Thornton 1986). Navajos during this era encountered a stream of Pacific Coast Athapaskan refugees who made the arduous journey by foot across the Rocky Mountains, upon learning of the existence of their linguistic kin to the east. The Navajo greeted the California Athapaskans as "Western immigrants" and long lost brethren and readily assimilated them into their nation in a testament to the mutual intelligibility of their respective languages (Matthews 1897:31-32). The Navajo also have a native term for Northern Athapaskans, *Diné nahodloni,* "also Navajo." Nineteenth-century Navajo lore describes a long trek to Canada by a party of Navajos, to visit the *Diné nahodloni* whose existence they still dimly recalled in legend (Morice 1914:155). These examples are indications of the affinities between Athapaskan speech communities in different geographic areas, affinities that suggest that the time of separation between the three branches cannot be immense. Back-migration of Apaches north may also be indicated by the presence of strong Apachean folklore motifs among the Northern Athapaskan Tsuut'ina (Curtis 1928:136-144).

Chronology of Athapaskan Origins

The relative chronology of the Na-Dene languages is widely accepted. Eyak diverged from 'undifferentiated' proto-Athapaskan prior to the divergence between any particular Athapaskan languages. However the effort to chart this divergence process in calendar years is more of an art than a science, demanding the liberal incorporation of non-linguistic data (usually archaeology or history). Depending on what interpretation

of the prehistoric record is applied, one can stretch or compress the relativistic linguistic chronology to fit a particular historical narrative.

The most often cited lexicostatistical estimates for Na-Dene languages are those of Michael Krauss (1973); “2400 ±500 years for Athabascan, and 3400 ±500 years between Athabascan and Eyak and about 4500 years for Tlingit” (Kari 2010:210). Krauss’ estimates are based in the conventional application of Morris Swadesh’s standard lexicostatistical methods, with only minor adjustments. There is considerable variation between the chronological estimates of different scholars, and much of this variability in the literature is conditioned by the application of non-linguistic data. For example, Kaufman and Golla (2000:51-52) estimate 3500 years divergence between Tlingit and Athapaskan (1000 years less than Krauss), while Swadesh’s (1954:362) calculations for this divergence (as mentioned) were as few as 2000 years; less than half of Krauss’ ‘canonical’ estimate. Krauss (1973:953) wrote that: “Kroeber ([1955] on extralinguistic grounds, and certainly correctly) thought these dates too low.” In Kroeber’s own words:

> In spite of its wide geographic spread it is obvious that Athabascan has well-marked consistency; and yet I should expect at least 20 centuries of separation, quite probably up to fully 30, for some of the more divergent of its branches, rather than for Tlingit from Athabascan (1955:92-93).

Skepticism of Swadesh’s unexpectedly shallow 2000 year date is understandable on linguistic grounds, considering that the genetic relationship between Tlingit and Athapaskan itself has only recently become universally accepted. The asymmetrical nature of the relationship between Tlingit and Athapaskan (more morphological than lexical) suggests that some combination of genetic and non-genetic (or contact-induced) factors may be at play, clouding the historical perspective; the estimated time depth

would vary depending on which linguistic features were considered diagnostic, and that is not clear. Ignoring the Tlingit issue, the widespread anthropological opposition to the youngest dates (<2000 years) for proto-Athapaskan and/or proto-Athapaskan-Eyak (excluding Tlingit) are not justified on linguistic grounds so much as they are rooted in basic incredulity that so massive, far-flung, and culturally diverse a family could be recent in origin. Harry Hoijer also had reservations about his own findings of a remarkably truncated chronology similar to Swadesh's:

> It is somewhat surprising to find how little time is involved in the break-up of the Athapaskan languages—the earliest time of divergence is only about 1300 years ago. The movement of the Pacific Coast languages to the south apparently begins almost at once and is essentially complete at a date roughly 1000 years ago. The movement of the Apachean languages southward appears to have begun somewhat later, about 1000 years ago and, if our dating is accurate, was not entirely complete until about 600 years ago (Hoijer 1956:232).

Hoijer's glottochronological estimates for Athapaskan diversification are problematic from the perspective of ethnographers like Kroeber, viewing Athapaskans as having deep cultural roots in various landscapes; Athapaskans occupy about the same sized territory as the Uto-Aztecans do, so therefore it follows they should be about the same age. As a means to address this paradox, Kroeber may have been the first to suggest that the Athapaskan languages are more radically conservative than other languages, resisting lexical change and therefore appearing younger than they are:

> But obviously if one set of languages were twice as resistant to alteration as another set, and the same formula were applied to them, the resistant set would emerge from computation seeming only half as "old" as the second set. The Athabascan and Uto-Aztecan groups have been recognized as stocks about equally long and with an analogous and approximately equal spread; it probably has been tacitly assumed that their principal component languages diverged about equally. It was on this generic parallelism . . . that I based my expectation that the Athabascan split-up would probably prove to be datable up to 30 centuries back. Hoijer's 13 centuries thus comes as a shock; and the possibility that the Athabascan languages are inherently

> more resistive to change suddenly confronts us with a certain insistence (Kroeber 1959:241).

Most of the revisions of Swadesh's and Hoijer's shorter-than-expected dates have involved the systematic purging of items in their word lists to exclude questionable matches resulting in a lengthening of the chronology by approximately 1000 years in the decades that followed their publications. A neutral assessment recognizes that the expectation of increased age has been the driving force of this revision; a different set of expectations would favor different results. It is equally possible that the Athapaskan languages are indeed very young and have had a remarkably succesfull expansion.

Krauss' 'canonical' elongated chronology is based on the fact that Hoijer and Swadesh both later increased their estimates for the breakup of Athapaskan back to about 2000 years BP, in response to data showing greater Athapaskan language diversity in Alaska than anywhere else. Twelve Northern Athapaskan languages were not adequately represented in the early calculations, with the Dena'ina of far western Alaska being the most radically divergent of these (Krauss 1973:952). It is clear that Athapaskan language diversification began in the far northwest. Nonetheless, the precise chronology is speculative and open to debate. It is possible that this timeline is indeed too short, as many assume. It is equally plausible that it is too long; the tumult of Athapaskan contact history could just as well be responsible for hastening lexical erosion, and thus the geographic spread of Athapaskan may even less than 1300 years, especially if the widespread assumption of linguistic conservatism is incorrect.

Another early critic of Hoijer's chronology was Wilhelm Milke (1959), who like Kroeber, primarily sought to lengthen the chronology with adjustments of Hoijer's

methods. Yet his work was an exception to the rule with respect to the Pacific Athapaskan subdivision, arguing for an even shorter chronology, as Kroeber notes:

> Milke points out that Hoijer appears to be conservative in recognizing cognates, especially on the Pacific coast. . . . [Then] the time of divergence would fall from 858 to 660 or 597 years—in far better accord with the distance separating them, and leaving the Pacific division much less anomalous in its internal organization (Kroeber 1959:257-258).

Standard estimates (following Hoijer) tend to place the Pacific Coast migration(s) in the late first millennium CE, just prior to the Apachean migration which in turn commenced in the early second millennium. However, Milke's truncated Pacific Coast Athapaskan chronology is notably similar to the standard estimates for the divergence within the Apachean branch, suggesting that both the Southern and Pacific migrations may have happened at nearly the same time, in the early second millennium. This is not to claim that Apacheans and Pacific Coast Athapaskans were one undifferentiated unit 1000 years ago; they were more likely distinct communities at that point, but they could have occupied different geographical positions in a vast Canadian Athapaskan dialect continuum. Multiple distinct speech communities were likely involved in subsequent migrations out of the urheimat. The question of when each departed is vexing because the chronological differences between the various non-Alaskan branches of the family appear trivial; it is difficult to ascertain, for example, whether Navajo is closer to Chipewyan or to Tsuu'tina, becsause Canadian Athapaskans languages would not have been deeply differentiated in late prehistory. The heterogeneity of linguistic innovation in the north is suggestive that Athapaskan dialects have 'cross-pollinated' each other, and Athapaskan bands have likely fissioned and reformed since the the Southern Athapaskan migration, meaning that the use of modern ethnic groups to infer family-tree lineages is not straightforward.

Despite the presence of deep internal differentiation in western Alaska, the Athapaskan expansion may be seen as a single coordinated event rather than multiple independent migrations in succession. Don Dumond discusses the homogeneity of the Candadian Athapaskan languages (Figure 1-1):

> [R]ivers debouching into the Pacific would have tempted some early Na-Dene to work their way coastward. . . . But in this case any linguistic evidence of early passage actually within the corridor has been blotted out by a later spread of specifically Canadian Athapaskan speakers from the north (Dumond 1969:859).

The path of proto-Na-Dene groups in the region is speculative. Dumond's mention of a "later spread of specifically Canadian Athapaskan speakers" is what merits discussion and scrutiny. It is from this zone that both Southern and Pacific Coast Athapaskan speakers emerged—although the Apachean/Southern branch likely budded off of this bloc to the east of where the Pacific branch emerged. It is hard to say, yet the same regional demographic expansion process likely accounts for both excursions, if one considers that the Pacific Coast migrants arrived at their destination by a more direct and expedient route than the Apacheans, and thus have resided in their current home for slightly longer. And if the Pacific branch remained in contact with the Northern branch longer than they did with the Apacheans, then this would make them appear closer to Northern Athapaskans in glottochronological terms even if their expansive 'push' commenced at the same time or earlier than the Apacheans. This could explain how the lexical diversity (represented as time-depth) between Pacific Coast Athapaskan (PCA) languages is greater than between the Apachean languages, while PCA taken as a whole unit is apparently *less* divergent from the Northern bloc. A Northern Athapaskan-PCA dialect chain stretching from the Columbia Plateau to Oregon may have existed for several centuries after the Apacheans became isolated from their

Canadian forebears. This would agree with Milke's observation that "it seems plausible that the similarity between Pacific and Northern languages is greater than that between the Pacific and Southern languages" (Milke 1959:188; my translation).

There is considerable chronological overlap between the standard migration models for both groups, with later dates for the PCA movements corresponding with the early dates for the Apachean movements. If this was an extended process involving multiple closely engaged dialects in a vast territory, it is plausible to envision the westernmost migrants moving rapidly southward along the coast in a contiguous strip remaining in contact with the Northern bloc. Meanwhile, neighboring groups moved east or southeast, initially remaining in contact with fellow Athapaskans but eventually turning sharply south further inland, ultimately forming the Southern/Apachean bloc.

The distribution of the numerous PCA bands is curiously not found in 'prime real estate,' with very little presence on the coast itself, but primarily in the remote and sparsely populated uplands, away from the lush river-mouths. This is intelligible as the effect of "gradual movement out from the interior, a movement essentially a matter of speech boundary advance from village to village" (Jacobs 1937:61). This is not migration into virgin territory, nor is it population replacement, but something in between—the progressive assimilation of smaller bands as the expansion frontier commences. "The languages of streams with fewer and smaller villages were less able to hold out against the numbers of aliens speaking upriver or interior languages" (62). By this reckoning, the PCA population is expected to be a fairly uniform admixture between Athapaskan migrants from the north, and 'Athapaskanized' local villages. The commonly held view of PCA languages as 'prestige' languages may support this notion.

Whistler's assessment is credible, favoring a slightly later thirteenth century CE date of entry for the California Athapaskans:

> Athapaskan entry was more recent than Jacobs implied. . . . Golla notes various cultural and linguistic evidence for recency of Athapaskan adaptation to California. Also, as mentioned, some of the linguistic diversity of California Athapaskan may have been the result of a spread of Athapaskan through asymmetric bilingualism with the language spreading to non-Athapaskan ethnic groups who chose to speak it rather than their former language. This phenomenon might also lead to overestimation of the date of entry of Athapaskan originally (Whistler 1979:74).

These same kinds of arguments are applicable to the late prehistoric Athapaskan movements into other regions as well, e.g. Dena'ina movements westward out of central Alaska onto the Yupik-dominated coast; Beaver and Chipewyans moving eastward into Algonkian territory southeast of Lake Athabasca and west of Hudson's Bay; and most famously, Apachean penetration of the Puebloan Southwest. Local archaeological cultures and regional genetic traits may tell one story, even as languages have rapidly changed due to the influence of shifting patterns of multilingualism through alliance formation. Multiple intertwined strands of demographic history are often present within a single speech community.

The Pacific Coast bloc is interesting because there is an intermediate group, a probable residue of the Athapaskan migrations in the now-extinct Kwalhioqua-Clatskanie-Owilapsh (KCO) Athapaskans who dwelled around the mouth of the Columbia River in Oregon and Washington State. KCO is a single language of three dialects, grouped with PCA on geographical grounds, but technically distinct from the other PCA languages in southern Oregon and northern California (Krauss 2005a:114). KCO is linguistically about equidistant from its nearest Northern Athapaskan and PCA

neighbors, and thus could be composed of remnant-bands in a chain of migrations connecting the Northern and Pacific Coast blocs.

Plains Apache (a.k.a. Kiowa Apache) in relation to southwestern Apachean is similar to KCO in relation to PCA, in that Plains Apache is too a single language distinct from all the other Apachean dialects including Navajo, which are themselves merely dialects of one Southern Athapaskan language (Hoijer 1971:4). Plains Apache, like KCO, has also been proposed as an intermediary or remnant in the Athapaskan migrations, between the Ttsuut'ina (a.k.a. Sarsi) of the Canadaian Plains and the other Apacheans to the southwest (Gunnerson and Gunnerson 1971:18-19). The Plains Apache resided in the Dakotas with the Kiowa in the eighteenth century (Brant 1951:9), and were known to have friendly relations and even occasional intermarriage with the Tsuut'ina through the Kiowa alliance with the Blackfeet confederacy to the north (Brant 1951:9; Hyde 1959:26-27). However, it seems more likely that the Plains Apache are a reflux migration of Apacheans back to the north, because they have much more linguistically and culturally in common with their Apachean brethren to the south, than with their Northern Athapaskan allies (Brant 1951:129; Opler 1983). Evidence of eighteenth century Tsuut'ina-Apache intercourse nonetheless indicates Athapaskan interconnectedness and unity through time.

Hoijer's early work (1938) lumped Lipan and Jicarilla Apache dialects into the same 'Eastern' or 'Plains' Apachean subgroup as Plains (Kiowa) Apache proper, but Hoijer's later refinements (1971) were instrumental in establishing a 'Southwestern' Apachean language including all Apachean dialects except Plains Apache. Nonetheless, one should not overestimate the differences between the languages

concerned. There may have been intervening historical factors which have distorted this chronology somewhat. As Morris Opler writes:

> Lexicostatistical data show that Kiowa-Apache did indeed differentiate from Jicarilla and Lipan earlier than these latter two dialects separated from each other. Yet the gap in time is not so great as may be supposed; the divergence time of Jicarilla and Lipan is a little over 200 years (Hoijer 1956; Hymes 1957). The Kiowa Apache divergence from Lipan and Jicarilla . . . occurred about 200 years earlier (429 and 401 years, respectively). The time difference may even be considerably narrower than available evidence can reveal. The federal government policy of consolidating southwestern Apacheans on a few reservations, begun in the 1870s, forced these six tribes into common speech communities and may, as Hoijer (1956:226) has pointed out, "account in part for the generally low times of divergence" (Opler 1983:368).

Intertribal contact situations on reservations might also have caused Eastern Apache tribes (especially the demographically challenged Lipan) to become more 'westernized' in their speech patterns, clouding the historical picture. Also, pre-contact-era Apacheans were certainly less divergent from the Northern bloc and likely retained stronger memories of their own northern origins.

Location of the Proto-Athapaskan Homeland

Using mean retention ratios (percentage of shared cognates) to infer a relative divergence chronology and also "ancient distributional patterns of the languages," Fowler (1977:103-104) suggested that "the Pacific and Southern groups were located near and closely related to Ingalik [Deg Hit'an] before they diverged." Further, he suggests that Tsuut'ina also has its roots in west-central Alaska, and that the Athapaskan expansion was a veritable explosion of people out of this region within a relatively short timeframe. These data further suggest that the proto-Athapaskan homeland was located in close proximity to the deepest lexicostatistical cleavage

between local Athapaskan-Eyak languages (Dena'ina, Ahtna and Eyak) in southwest-central Alaska (Kari 1989).

The other school of thought on this matter, embodied by Krauss and Golla (1981:68), is that the Proto-Athapaskan homeland is in a less diverse region, eastern interior Alaska or the western British Columbian cordillera. This is argued on the basis of the surprising lack of Eskimoan loanwords in all Athapaskan languages except for Dena'ina and Deg Hit'an, which suggests that Proto-Athapaskan could not have been subjected to a long history of contact with Yupik the way that Dena'ina and Deg Hit'an have been. It therefore must have been located considerably to the east, in the Upper Yukon drainage and/or northern British Columbia. While this view is the most widely accepted in the literature, it is somewhat lacking in corroboration from other forms of evidence, and based on the assumption that the Proto-Athapaskans were present in their original homeland for a long time. If the Athapaskan arrival in Alaska was immediately followed by rapid migration and dispersal toward the interior, then the Yupik influence upon Dena'ina and Deg Hit'an could simply reflect the last millennium or so of contact history. Eskimo influence upon Dena'ina is relatively slight, and could be explained as a product of loanwords transpiring after the major expansion of the Athapaskan languages out of western Alaska had commenced (Kari 1989:552).

The Alternative 'Long Chronology' Model for Athapaskan Origins.

Ever since twentieth-century scholars recognized that Native American occupation of the Americas began during the terminal Pleistocene, there have been many concerted efforts to characterize the map of the Athapaskan languages in terms of presumed *in situ* post-Pleistocene growth (Harrington 1940; Kari 2010; Krantz 1977; Rogers 1985; Rogers et al. 1990). Such efforts, at least with regard to Athapaskan

proper, must be characterized as marginal to mainstream historical linguistics, for assuming glacially slow rates of language change without historical precedent. Nonetheless, there has been a marriage of convenience between long-chronology advocates and prominent biological anthropologists who favor single-wave migration scenarios (Rubicz et al. 2002); likewise with archaeologists who anachronistically characterize the Northern Archaic microblade users of Alaska and Canada as "Athapaskan." Cross-disciplinary syntheses have thus given the long-chronology undue influence within anthropology in general, considering its relatively poor support on linguistic grounds.

But it is the demonstrable lack of archaeological continuity in late prehistory througout most of the Athapaskan heartland that is the strongest support to justify the short chronology (Shinkwin 1977). This recourse is natural considering the inherently relativistic nature of linguistic dating. It might even be argued that standard short-chronology estimates of 2000-3000 years divergence between Athapaskan languages (Krauss 1973:953) are rather slightly too long to be reconciled with archaeological evidence for Athapaskan presence which is substantially younger than 2000 years in most (if not all) cases (Perry 1983:720). These data are compatible with a number of different short-chronology scenarios; language diversification may have already begun prior to settlement, or contact-induced change involving extinct local languages has resulted in deepening of differentiation, or a combination of both factors (Weiss and Woolford 1986).

Some long-chronology advocates maintain that the original Na-Dene homeland was in an ice free refuge on the northwest coast during the Pleistocene, because all

three generally recognized subdivisions of the Na-Dene family were found occupying coastal terrain in the contact era, from Cook Inlet to California (Rogers et al. 1990:133). This model is based on a standard convention of historical linguistics; "it is assumed that the development of language diversification is proportional to time depth of human occupation of an area" (Gruhn 1988: 77). While this is logical on the surface, it requires that the diversification has occurred in-situ, which is not necessarily a valid assumption. In the Na-Dene case this assumption is unwarranted, because of strong evidence (both archaeological and ethnographic) that the groups in question have migrated from other locations in recent centuries. As William R. Fowler Jr. put it: "[o]pinion on these issues has diverged sharply and been polarized by the unnecessary and unfounded assumption that present distribution reflects ancient distribution" (Fowler 1977:102).

Archaeological Evidence for Athapaskan Origins

Evidence for Interior Origins

The few examples of coastally-adapted Athapaskans (Dena'ina in Alaska and a small minority of PCA languages) are all late-Prehistoric intruders in the region (Dzeniskevich 1981; Whistler 1979). Moreover, Eyak is closer to Athapaskan than any other language, and most likely a late coastal intruder as well, for "they had a land-based economy and, unlike the Eskimo or Tlingit, never became sea-mammal hunters" (Krauss & Golla 1981:68). Even Tlingit sea-mammal hunting may be a comparatively late adaptation; oral traditions provide compelling evidence for interior origins, and a number of early "ethnographers viewed Tlingit settlement of southeast Alaska as recent, perhaps within the last 500 years" (Moss 2004:184). Archaeological evidence suggests somewhat greater (but still moderate) antiquity for Tlingit settlements, perhaps between 500-1000 C.E. (Moss et al. 1989:540). This ~500-1000-year discrepancy between

archaeologically and ethnographically derived estimates for Tlingit origins could be readily accounted for by Krauss' model which postulates a 'hybrid' origin for the Tlingit; the non-Na-Dene segment of the population would likely be the one with longstanding roots in the coastal region, while the Na-Dene linguistic culture was 'grafted' onto this trunk somewhat later (Krauss 1973:960-963). It is not necessarily the case that continuity in the archaeological record is indicative of linguistic continuity. Furthermore, the view that Proto-Athapaskan and Proto-Na-Dene cultures were interior-adapted does not necessarily mean that this interior adaptation was first developed in North America. The interior-adaptation of Na-Dene society could have been developed in Asia and transferred to North America by the migrants (Murdock 1955:86).

The Problem of Archaeological Visibility

The chronological framework of the 'Athapaskan' prehistory of North America for the millennia prior to the second millennium of the Common Era is one area where the archaeologists are decidedly more beholden to linguists than the other way around. Given the inherent guesswork of glottochronology, this does not instill confidence. For glottochronological estimates, archaeologists rely mostly on the opinion of linguist Michael Krauss (1973), which is in turn conditioned by the earlier opinions of Hoijer and Swadesh. The entire field is rife with speculative musings and tautologies, as John Ives notes. "Assessments of continuity and discontinuity lie too often within the realm of opinion and intuition, lacking the clear definition required for their evaluation" (Ives 1990:55). Moreau Maxwell accurately states that "several archaeologically distinct complexes from across the subarctic have contributed to the development of Athapaskan people" (Maxwell 1980:178). But this does not imply that a contribution to the development of a culture (however significant) is identical to linguistic ancestry.

Many non-Athapaskan speakers have contributed to the development of known Athapaskan cultures. Similar events in prehistory would help explain the diversity.

Despite the fact that Northern Athapaskans occupied most of the land of northwest interior North America at the time of European contact, the evidence for the prehistory of Athapaskan societies is remarkably sparce. There have been numerous efforts to connect archaeological cultures to those of ethnographic Athapaskans, with mixed results. In western Alaska, for example, Frederica de Laguna found a tremendous quantity of historical Athapaskan material, and some late prehistoric material, but no strong continuity with earlier cultures in the region. She notes that "the material from the middle and lower Yukon is for the most part so modern that it might with some justice be called ethnological rather than archaeological" (de Laguna 1937:154). One may attempt to draw conclusions about linguistic continuity based on a few common threads in the toolkits of ethnographic Athapaskans and earlier prehistoric cultures. Athapaskans did use some of the same tools that have been present for millennia in Alaska; for example *chi-thos* (simple stone choppers or hide-scrapers) are one category of artifact which connects ethnographic and late prehistoric cultures with earlier prehistoric cultures in the region. It may nonetheless be problematic to infer an Athapaskan linguistic pedigree on the basis of such implements, regardless of context. J.L. Giddings makes essentially this point about the prehistoric Kobuk River culture of northwest interior Alaska:

> A close comparison of Kobuk archaeology with inland Athapascan ethnology might then bring out striking similarities, but these could only prove that *Athapascans have recently made use of ideas that were once in vogue along the Kobuk.* It would not mean that Kobuk people of a remote time spoke an Athapascan language, or practiced an "Athapascan" form of culture. The significant fact remains that we have practically no

> archaeological knowledge of the Athapascan-speaking peoples who have in historic times occupied nearly all of the American boreal forests (Giddings 1952:114; emphasis original).

The strongest case for a Northern Athapaskan 'type-site' may be Klo-kut in northwest Yukon Territory, near the Alaska border. There the historic phase is associated with Gwich'in peoples. Indeed, lozenge-shaped Klo-kut (a.k.a. Kavik) type arrowheads are associated with late prehistoric Athapaskan societies in numerous northern locales, from historic Carrier and Chilcotin territory in central British Columbia all the way to central Alaska. Yet the simple use of Klo-kut type points to diagnose Athapaskan presence is not without its problems they are also "disturbingly similar" to late prehistoric Inuvialuit Eskimo arrowheads found near Tuktoyuktuk, and to probable Yupik points from southwest Alaska (Morlan 1970b:29). Given the widespread interest in Athapaskan prehistory in the north, Richard Morlan called it an "intemperate reflection" when Frederica de Laguna (in her concluding address to a symposium of the Canadian Archaeological Association) pointed out the elephant in the room: "that there is no entity identifiable as 'Athapaskan prehistory'" (Morlan 1970a:2). Kavik points may be associated with the spread of particular archery technologies which were often, but not exclusively, used by Athapaskans. But the Klo-kut site itself demonstrates only about one millennium of Athapaskan presence in Gwich'in territory, not more:

> In short, the Kavik type stone point may be one of our best hallmarks of late Athapaskan sites, and the absence of the type in the early period at Klo-kut may indicate that other diagnostics must be found for somewhat earlier horizons. The Klo-kut sequence, on the other hand, spans little more than the last millennium (Morlan 1970b:29).

Such evidence has been used to argue that the Gwich'in are late prehistoric migrants into their current territory (Hall 1969). But a similar lack of time-depth is

observed at numerous Athapaskan sites throughout the north, so pinpointing the source of the Athapaskan expansion has continued to be a challenge. Of the several sites with late Athapaskan phases noted by Edwin Hall only one, Aishihik, (Southern Tutchone territory, southwest Yukon) has any claim to being more than 1000 years old, and thus is the main evidence for tenative claims that Proto-Athapaskan culture descended from that of Archaic microblade users. Yet early Aishihik "lacks many traits of the later, definitely Athapaskan phases" (Hall 1969:317-318). So the notion that early Aishihik represents Proto-Athapaskan culture is not well supported. John Ives writes:

> For later prehistory, essentially the last 2000 years in interior northwestern North America . . . there is no single archaeological culture, no set of key artifacts or elements that can be conveniently "tagged" as Athapaskan. . . . It is somewhat of an irony that, in virtually every case given here, there is a fair degree of uncertainty about whether or not an "Athapaskan" prehistory has been described. . . . There does not exist a means to determine from lithic assemblages which language a prehistoric people spoke. And finally, the best correlations for individual artifacts or assemblages in northwestern North America are with gross environmental regions, and *not* maps of language distribution (Ives 1990:54-55).

Most archaeologists think that Northern Athapaskan groups achieved their modern distribution by 1000 CE (Matson and Magne 2007). Some exceptional areas were populated slightly later; these include parts of southwest Alaska and central British Columbia which were settled by the thirteenth century (Dumond 1980:34; Dzeniskevich 1981; Wilmeth 1977). But to say therefore that the Athapaskan presence in the center of this spread-zone is firmly established by 1000 CE is an exaggeration; in many cases this date is simply assumed due to a lack of firm evidence to the contrary. Don Dumond (1980:34) says "[s]ites clearly representing pre-contact age Athapaskan occupations are of almost legendary scarcity, however, and it is by no means certain that they were anywhere in Alaska before the late first millennium BC." Even to say, as Dumond does,

that some “Athapaskan” sites in Alaska are as old as 2000 years (or more) reflects his abiding faith in the linguistic estimates of Michael Krauss.

Investigating the cultural remains of Tanana Athapaskans of central Alaska, Anne Shinkwin expresses confidence in an Athapaskan cultural phase spanning most (but not all) of the second millennium CE, which cannot be linked to the earlier cultures identified in the region during the first half of the first millennium CE (Shinkwin 1977:44). In other words, there is something like a 600-year gap of cultural indeterminacy in central Alaska during the middle of the Common Era. It may come as a surprise that the earliest firm evidence for Athapaskan occupation of central Alaska is (give or take a century or two) roughly the same time as that of the Dena’ina expansion into Cook Inlet, the Chilcotin penetration of the Columbia Plateau, or the Pacific Coast Athapaskan push into California (Dzeniskevich 1981; Whistler 1979; Wilmeth 1977). There are even some credible recent efforts to demonstrate that the Apacheans arrived in both the northern and southern portions of the Southwest only slightly later, as early as the late thirteenth and early fourteenth centuries (Seymour 2008; Towner 2003). Athapaskans were virtually invisible in the first millennium CE, and then they appeared suddenly in the second millennium CE, rapidly attaining a geographic distribution of unparalleled immensity for a New World family. This is a remarkable fact that begs some historical explanation.

A Yellowknife Chipewyan Exception?

The position outlined above reflects an adherence to the direct historical approach to archaeology. This method dictates that the only way to make linguistic inferences about prehistoric cultures is through direct historical observations of the ethnographic present and the recent historical past, which may form a ‘bridge’ to late prehistory which

can be followed only as long as there is no major discontinuity in the record. Otherwise, any case for the linguistic affiliation of archaeological remains is purely speculative.

The direct historical method has yelided only one formidable case for unbroken continuity between Athapaksan speakers and archaeological cultures more than 2000 years old. William Noble's (1975, 1977) work in the central district of Mackenzie, Northwest Territories has apparently revealed 2200 years of continuity using the direct historical approach, measured back in time from settlements of the historical Yellowknife band of Chipewyan. Noble connects the dots between about nine distinct archaeological cultures, with the Taltheilei Shale tradition of circa 200BCE being the oldest and representing Proto-Athapaskan culture in Noble's view. Interestingly, he posits that Taltheilei may derive at least in part from the (presumably-Eskimo) Arctic Small Tool (AST) tradition, which is possibly an admixed Eskimo-Athapaskan culture according to Noble (1975:777). An Athapaskan identity for Taltheilei does not seem obvious on the basis of apparent similarities with late AST; if correct, then it forces revision of the standard view that AST equates to Eskimo prehistory in the region.

There are several problems with this work, however. Historical continuity back to Taltheilei times is evident only in the remote and geographically isolated region north of Great Slave Lake (adjacent to Eskimo territory to the east), along the northeastern periphery of the Athapaskan bloc as a whole. Similar historical continuity is not found among any of the other nearby Athapaskan bands (Dogrib, Chipewyan 'proper', and Slavey). Only Chipewyan 'proper' have anywhere near 1000 years of occupation in the region; most bands have substantially less. Yellowknife oral tradition furthermore states that the people originally inhabited the south side of Great Slave Lake (near other

Chipewyan speakers) moving north only later. Yet the very old sites are exclusively on the north side of the lake. Noble is forced to dismiss these problems when he says "Yellowknife origin mythology helps little and, at present, appears to be highly unreliable" (Noble1975:777). The Yellowknives are now extinct, suffering depopulation due to influenza and other diseases. The few survivors were absorbed by neighboring Dogrib and Chipewyan groups in the early twentieth-century (Gillespie 1981:288).

Given that Yellowknife history is so sparse, it is difficult to rule out the possibility that descendants of Taltheilei shale people were not themselves Athapaskans, but were simply amalgamated with intrusive Athapaskans in the second millennium CE, resulting in apparent material-cultural continuity masquerading as linguistic continuity. Native copper implements appear suddenly during the Frank Channel Complex, 1300-1500 CE (Noble 1975:774). The ethnonym "Yellowknife" indicates that this particular band of Chipewyan was involved in the copper trade. Integration of Athapaskan speakers into Taltheilei descendant cultures after 1300 CE, followed by linguistic replacement, is another possibility. Noble's work suggests Yellowknives had a distinctive material culture (not shared by other Chipewyans), despite the fact that the two groups spoke closely related dialects and were seen as indistinguishable by the earliest authorities.

> The material culture of these two Chipewyan groups appears to be operating independently of the linguistics. . . . Lexico statistical estimates presently offer little help in dating the eastern Chipewyan sequence. . . . Hoijer (1956:228) once suggested that the eastern Chipewyan-Beaver Indian divergence occurred about 475 years ago, and that the Southern Athapaskans diverged from the Northern Athapaskans (including the modern Chipewyan) less than 1000 years ago. Clearly the estimate . . . does not align with the archaeological date for Athapaskan assemblages in either northern Manitoba or central District of Mackenzie (Noble 1975:778-779).

But neither does this archaeological evidence align with late eighteenth and early nineteenth-century Chipewyan and Yellowknife oral traditions suggesting that the two groups were until recently one undifferentiated unit, and that the Yellowknives migrated to north of Great Slave Lake “at no very distant period” (Franklin 1824: v.2, 76). Chipewyan origin traditions stated that the group had migrated from the far west, originating on a continent on the other side of the Pacific Ocean (Mackenzie 1902: v.1, clxxiii). The linguistic and ethnological evidence are in agreement; it is only the archaeological evidence that appears to contradict them. The error could be in the interpretation of the evidence. To phrase Giddings (1952:114), I would suggest that the Yellowknife-Chipewyan simply “made use of ideas that were once in vogue” among the Taltheilei daughter cultures. It does not make sense that an area of low language diversity on the easternmost fringe of the northern Athapaskan expansion zone would have the oldest Athapaskan tenure at more than 2000 years, when areas of much higher Athapaskan language density in central Alaska have generally less than half this time-depth in direct historical sequence.

The White River Ash Fall

Given the extreme paucity of evidence for Athapaskans in the first millennium CE, there has been much interest to learn what could have prompted the sudden expansion of Athapaskan speakers from a presumably small territorial nucleus. One popular theory was independently advanced by William Workman (1974) and David Derry (1975), and has been favored by several others since (Ives 2003; Moodie et al. 1992). Two eruptions of the White River volcano in southeastern Alaska during the first millennium CE were responsible for spreading a white volcanic ash horizon several inches thick, northward and eastward over more than 125,000 square miles of territory

into the upper Yukon basin of the Yukon Territory and adjacent portions of Alaska. The first of these two eruptions occurred in the early second centrury of the Common Era, and the second occurred in the late eighth or early ninth century (Ives 2003:266). The epicenter of this volcanism is roughly the same as Michael Krauss' (1973) opinion of the likely location of the Proto-Athapaskan linguistic homeland, and these events occurred prior to the early-second millennium arrival of Athapaskan speakers in most of their current territories. Therefore, many scholars have chosen to regard these two successive cataclysms, *post hoc,* as the events which precipitated the Athapaskan expansion in its various manifestations.

Derry (1975:144) maintains that the second eruption of the volcano (in the late first millennium CE, responsible for the eastern ash field) spurred both the northward and southward movements in the Athapaskan expansion. By his reckoning, the Gwich'in penetration of North Alaska was one major result, as was the spread of Klo-kut arrowheads and bone and antler projectile points throughout Northern Athapaskan territory. Moodie and colleagues have similar views to those of Derry, but also attribute the rise in native copper exploitation among Athapaskan cultures to the flight of the volcanic refugees, who allegedly brought knowledge of the metal with them from the White River, preserved as oral tradition and spreading as far as Yellowknife/Chipewyan territories in the east (Moodie et al. 1992:163). Workman (1975:254) suggests that this second (eighth/ninth century) eruption spurred both the Pacific Coast Athapaskan and the Apachean migrations, while Ives (2003:267) suggests that the PCA movement was spurred by the first eruption (second century) and only the Apachean movement was

spurred by the second eruption. Thus various authors have attributed almost all the Athapaskan migrations to the effect of White River ashfall, in one way or another.

The actual expansion according to this model would be relatively fast but gradualistic, with displaced bands displacing other bands in a domino effect over the course of centuries, with subtle cultural transformations ensuing which would presumably have masked the actual traces of these migrations in the intervening space. This all is necessary because there is no firsthand evidence of migration in the wake of the volcano. The model is based on the coincidence of Krauss' (1973) linguistic hypothesis with the location and timing of a cataclysm which took place prior to the dispersal (*post hoc ergo propter hoc*). Workman describes the movements:

> The "primary refugees", those affected directly by the ashfall, if successful in establishing themselves on the periphery of the affected area, would have displaced in turn other groups of Athabaskan speech. . . . Eventually, at the southern periphery of the Athabaskan world, some groups would have been detached to the south into the domain of alien peoples. . . . It does not seem unreasonable that such small detached groups might be obliged to move a long distance before they found a land in which they could settle. . . . Attempts to trace this hypothesized movement south by archaeological techniques would seem premature. . . . This may never be possible in great detail as the material culture of these peoples may have been transformed as they spread (Workman 1974:255).

A gradualistic model is necessary to explain the great demographic success of the refugees and the steady population increase as the people moved south. Considering the very low population density in the primary affected zone, as well as the fact that the most severe ashfall was in only a small fraction of the affected area, it is counterintuitive that the Apachean descendant cultures thousands of miles away from the event came to numerically overrun all of the well-established local cultures in the Southwest. The notion that the 'primary refugees' stopped on the edge of the affected zone and displaced others (who also expanded outward cascading fashion) makes the model

seem more demographically feasible, but it does not harmonize with the Chipewyan and Yellowknife oral traditions for the origin of copper metallurgy which place their cultural origins in Alaska's copper districts (Moodie et al. 1992). Based on their argument of oral tradition related to the volcano itself, there must have been "primary refugees" well outside of the periphery, a dilemma which reintroduces the paradox: how to explain the demographic and cultural success of a few displaced refugees? In its favor the ashfall displacement model is holistic, attempting to come to grips with the speed and scale of the Athapaskan expansion in its entirety. Other proposed archaeological models of the Athapaskan expansion merit discussion (Wilcox 1981; Perry 1979), but space does not permit.

Ethnographic Reconstruction of Proto-Athapaskan Culture

Local manifestations of Athapaskan culture (particularly the divergent Southern and Pacific Coast Athapaskan offshoots) often closely mirror non-Athapaskan neighbor cultures. It is thus commonly held that they "borrowed their culture almost en masse from their neighbors" (Tsuchiyama 1947:1). In other words:

> Somewhere in the course of their migrations Athapascan blood became mixed with that of the Tanoan, Keresian, Yunian, Zunian, and Shoshonian peoples . . . the strength of which may have allowed little but the Athapascan language to filter through (Wagner and Travis 1979:481).

No doubt the incorporation of foreign cultural elements throughout the duration of the Athapaskan expansion has accelerated the obvious cultural divergence between Northern, Southern and Pacific Coast blocs. But no less problematic is the widespread view that all distinctive cultural elements held in common between neighbors are borrowed by the Athapaskans from non-Athapaskans (rather than vice versa or independently reintroduced). This can be attributed largely to the tenuous

presupposition that proto-Athapaskan culture is similar to that of “the least developed tribes of the northern area” (Tsuchiyama 1947:1), meaning those complex traits observed in any particular Athapaskan society must have been derived from linguistically unrelated neighbors via historical borrowing. This seems especially remarkable given another widespread presupposition; that Athapaskan languages themselves are extremely conservative and resistant to change. Oddly polar opposite tendencies are assumed for different portions of the Athapaskan sociocultural ‘spectrum’; linguistic conservatism contrasts with cultural gregariousness.

A shorter linguistic chronology for the beginning of the expansion (less than 2000 years) reduces the degree to which Athapaskan linguistic conservatism is noteworthy; shorter duration equals fewer opportunities for contact-induced change with neighbors en route. Likewise, a model which posits extremely rapid movements, particularly for the Southern Athapaskan migrants, would maximize their term of occupancy in their current homeland (to between circa 500 and 800 years BP), allowing for greater opportunities for acclimatization and acculturation. Rapid migration also greatly reduces the likely impact of their physical presence on the intervening landscape. The disparate trends (of linguistic homogeneity and cultural heterogeneity) are thus explicable without recourse to Athapaskan exceptionalism.

Further corroboration of the common cultural (rather than simply linguistic) template for the three disparate Athapaskan blocs is observable through the underutilized technique of ethnographic reconstruction. Such work is pioneered by Perry (1983), to whom I am here indebted. The method is straightforward in theory if not always in practice. Where distinctive cultural elements are found frequently in

multiple different Athapaskan contexts but rarely or never in intervening non-Athapaskan contexts, then these features are strong candidates for inclusion in a list of Proto-Athapaskan culture traits. When general trait categories are widespread and not ethnically bounded, reconstruction difficult, but still possible, if particular patterns of traits are frequent in Athapaskan contexts but rare or absent elsewhere. Such patterns could take the form of unique details or sequences of cultural motifs in close association in far-flung but linguistically linked contexts. Such occurrences can point to an early Athapaskan presence of features in question, and possibly to an Athapaskan origin for the system or template as a whole. Perry's (1983) work forms the starting point for this discussion.

Eschatology: Death and Rebirth

Na-Dene mortuary customs are shared in all three geographic blocs. Cultures as far removed as the Tlingit, Upper Tanana, Western Apache, Navajo and Hupa all mandate removing a recently deceased person from a dwelling through some opening other than the door (Brugge 1978:313; Goddard 1904:70; Perry 1983:726). This is done to prevent the living and the dead from ever using the same path, which could provide a path for the ghost to return. This ghost is conceived of only as the malevolent portion of a two-part entity; the benign or beneficent portion of which is not a threat to the living (Honigmann 1945:467-468). Numerous Athapaskans residing in all three culture areas practiced strict name avoidance of the deceased (to prevent any invocation of malevolence) and frequently abandoned and/or destroyed the deceased's possessions and dwelling (Goddard 1904:39, 71-73; Honigmann 1945:469; Perry 1983:726). Tlingit, Hupa, Tsuut'ina and Navajo all allowed a four-day period for the spirit to continue to occupy the corpse prior to the funeral (Brugge 1978:315-316; Honigmann 1945:468-

469). Elevated surface burials on a tree or platform (often reserved for specific categories of individuals like infants or shamans) have a wide distribution among Na-Dene peoples, reported for Tlingit, Northern and Southern Athapaskans (Brugge 1978:315; Hrdlička 1905:493). The notion that owls are fluent Athapaskan speakers and harbingers of death is found in Athapaskan contexts as far removed as Dena'ina and Apache (Hrdlička 1905:489; Perry 1983:726).

The extreme physical danger posed by contact with corpses is well known among Southern and Pacific Coast Athapaskans, and some Northern Athapaskans like the Tsuut'ina and Deg Hit'an; the danger is particularly acute for relatives of the deceased (Goddard 1904:72-73; Honigmann 1945:469; Opler 1936:222-223). Some Canadian Athapaskans are an exception. For example, Carrier widows carried the bones of their dead husbands with them (hence the name "Carriers"). Morice (1925:576) suggests that these anomalous mortuary practices were recently borrowed from neighboring Tsimshianic coast-dwellers, as they are not practiced by more interior-dwelling folk. This explanation appears plausible; much farther north, Athapaskan eschatology falls into a pattern more reminiscent of the two southerly branches. Alaskan Athapaskans, like the Deg Hit'an, demonstrated an extreme fear of corpses rivaling that of their distant Apachean kin (Dall 1897:67). Perry notes:

> it is likely that in Proto-Athapaskan ideology the human spirit was believed to have two components, one of which was associated with breath, vapor, wind, or air, and the other conceived of as a shadowlike entity. One of these continued to be associated with the corpse for a time, representing danger to the survivors. Practices intended to deal with this included avoiding the name of the deceased, destroying or abandoning his property, removal of the corpse through an opening other than the doorway of the dwelling, and destruction or abandonment of the dwelling in which death had occurred (Perry 1983:727).

Residence Patterns and Familial Descent

Matrilocal residence is preferred by the vast majority of Northern and Southern Athapaskans; Perry (1989) identified 27 different Athapaskan ethnolinguistic subdivisions, distributed uniformly throughout both major geographic blocs, for whom this is the predominant residence pattern. Furthermore, at least twelve Athapaskan groups (clustered in the western halves of their respective blocs) primarily reckon their kinship and descent through the mother's line (matrilineally). The Pacific Coast Athapaskans are the exception to this rule, fitting within the California pattern of patrilineal/patrilocal kinship and residence. Early twentieth-century anthropologists were uniformly of the opinion that the western Athapaskan kinship system was a product of diffusion from the Northwest Coast, but more recent scholarship recognizes "that the diffusion explanation is too simplistic" (VanStone 1974:52). "Although it is often assumed that the matrilineal organization of the Athapascans . . . and of the Eyak, represented coastal influence, the opposite may be true" (Drucker 1963:198). The high frequency of matrilineal organization among Athapaskans in Alaska, the Canadian Cordillera, and the Southwest are indicative that these patterns were already prevalent at the Proto-Athapaskan stage of development, and possibly earlier (Jett 1978; Murdock 1955; Perry 1989). The easternmost groups, both north and south, emphasize bilateral descent systems, possibly as an adaptation to specific environmental circumstances (Perry 1989:40; VanStone 1974:53).

Earlier scholarship attributed the development of matrilineal-matrilocal patterns among Northern Athapaskans to a dependence on salmon, and the importance of women's work in riverine economies. But "Athapaskan specialists no longer believe that most groups were as dependent on fish as had been previously supposed"

(VanStone 1974:52). Some matrilocal Northern Athapaskans even practice strict fish avoidance, like the Sekani who “disdain fish of any kind and regard fishing as a degrading occupation unworthy of a hunter” (Morice 1889:130). In their juxtaposition of a strong disdain for fish with matrilocality, Sekani are like all of the Southern Athapaskan groups (Landar 1960).

Richard J. Perry (1989:43-44) favors a scenario where matrilocality and matrilineal descent patterns were reinforced among mountain dwelling Athapaskan groups of the west (both north and south) who featured semi-permanent or permanent female-dominated base camps and high rates of male absenteeism during seasonal hunting trips; matrilineality was subsequently lost among more mobile eastern groups where women traveled with the men. Yet matrilocality was largely preserved in the eastern Athapaskan range, even as matrilineal descent was apparently abandoned. Perry’s model favors the preservation of matrilocality, but does not quite explain matrilineality. VanStone (1974:53) suggests that the shift to bilateral kinship reckoning in the easternmost bands may have been a result of more extreme environmental factors, as “a larger number and variety of kinship affiliations” is an adaptive; more kinfolk is a larger support network increasing the odds of an individual’s survival. Regardless of the ultimate cause, matrilineality is an anomaly among foragers, with only thirteen of 101 hunter-gatherer groups in Murdock’s (1957) world ethnographic sample being matrilineal, six (or seven) of the thirteen are Na-Dene speakers (Perry 1989:34).

Some mid-twentieth-century scholars suggested that the original Na-Dene migrants from Asia may have brought a matrilineal descent system with them from the Old World, and this system was subsequently lost among the easternmost Athapaskans

(Birket-Smith and De Laguna 1938:449; Garfield 1953:61; Murdock 1955:86-87). This would help to explain why forager social-structure is so decidedly un-forager-like in this case (Kelly 1995:270-278). The Asian-origins view was conditioned to some degree by the linguistic evidence for a relationship between Na-Dene and Sino-Tibetan languages (Sapir 1925, 1991; Shafer 1952). Some culturally Tibetan groups (like the Naxi) were matrilineal up until the twentieth-century, as were some Altaic dynasties of Inner Mongolia during the early Common Era. The Chinese are today patrilineal, but philological and archaeological evidence suggest that matrilineal descent may have been the norm among horticulturalists in Neolithic China (Pearson and Underhill 1987). Criticism of the Asian-origin hypothesis for northwestern North American matrilineal social structure rests mainly upon the extreme distances between known matrilineal societies of interior Asia, and those of North America (Garfield 1953:59). Furthermore, the old pervasive skepticism toward theories of Athapaskan-Asian language relations is easily extended to theories of the importation of matriliny, as "complex, speculative explanations for which there is little empirical basis" (Perry 1989:47).

Female Fortitude and Spiritual Potency in Mensturation and Childbirth

Athapaskan societies in all three geographic blocs (Northern, Southern and Pacific Coast) shared a common belief in an extreme cosmic danger posed by menstruating women, and in the particular importance of female puberty rituals. These sorts of beliefs are not unique to Athapaskans, but are nearly ubiquitous in the American West. But Athapaskan examples include distinctive features and are noteworthy both for the intensity of these beliefs and the degree of importance placed on associated ritual observances. The emphasis on public celebration during puberty rituals is more intense in the Southern and Pacific Coast blocs, while the emphasis on seclusion of the new

menstruant is more intense as one moves north, however this Athapaskan puberty/menstruation/childbirth ritual-observance pattern includes a series of similar public and private elements found in multiple geographic areas.

The isolation phase of the puberty ritual lasted as long as a year among some Gwich'in, a month among the Upper Tanana in Southern Alaska, and as few as ten days among the Kaska in British Columbia (Perry 1983:724). Both extremes were present among the Dena'ina, as seclusion could last anywhere from one week to one year, depending on who was asked (Osgood 1937:162). Among the Chiricahua and Western Apache, this entire phase is condensed into a period of a few preparatory days leading up to a major public ceremony. Yet in all these disparate groups (plus Navajo) the girl is forbidden from touching herself and is given a scratching stick to remedy itches. All of these (plus Mescalero and with the exception of Kaska) likewise forbid the girl from directly touching water, providing her with a drinking tube. The gaze of the menstruant is especially hazardous, and many Northern groups compel her to look downward and utilize special face covering hoods to prevent inadvertent eye contact. The Upper Tanana and Mescalero Apache forbid her from looking at the sky, and Eastern Navajo also cover her face (Driver 1941:33; Perry 1983:724).

> In many respects femaleness entailed a sense of danger. Practices designed to avoid this danger included menstrual seclusion, the use of scratching sticks and a drinking tube, and seclusion or purification associated with childbirth. Although girls' puberty recognition and menstrual seclusion are almost ubiquitous in western North America, the Athapaskan pattern again shows a number of distinctive aspects (Perry 1983:723-724).

Throughout much of Northern California, puberty ceremonies are frequently the most important social gatherings held (akin only to Apache puberty rites in that regard). Among native Northern Californians, the immediate family of the pubescent girl is

imperiled by ghosts upon the commencement of the public ritual. “In great contrast to this feeling of fear of ghosts on the part of the girl and her family is the spirit of merriment enjoyed by the crowd” (Driver 1941:33). Like both Southern and Pacific Coast Athapaskans, central Alaskan Athapaskans also have a public celebration as a major component of the puberty rite (Perry 1983:725). Southern Athapaskans believe that the pubescent girl has access to tremendous healing power which may be transferred to the participants in the public celebration; this is an unusual characteristic of the Apachean rite that is shared with only the North Pacific Coast—indicating a likely historical connection between these culture areas (Driver 1941:34). In particular, the similar public puberty rituals of the Southern and Pacific Coast Athapaskans are highly suggestive of a common origin in the Canadian Cordillera within the last ~1000 years, as Driver maintains. “The predominant type of public puberty ceremony originated on the Northwest Coast and spread southward mainly by migration, perhaps entirely in the custody of Athabascans” (Driver 1941:62). He elaborates:

> Athapaskans in the Southwest brought their puberty rites with them in their migrations from north to south. These rites share more with northern California rites than with those of any other area. The presence of Athapaskans in northern California fits into the picture. . . . I believe . . . that at least some of the puberty details shared by northern Californians and Apacheans are heritages from their common protoculture (Driver 1969:906).

To Athapaskan women is attributed great spiritual fortitude allowing them to withstand the spiritual dangers posed by menstruation and childbirth. Among the Tagish and Southern Tutchone, women are discouraged from hunting, not for lack of requisite skill, but because the spiritual power of menstruation is frightening to the prey (Cruikshank 1979). Similarly, menstruation is considered disruptive to Navajo ceremonial efficacy; a menstruating chanter or singer (hataahi) attempting to propitiate

beneficent deities would risk driving them away. Only men and postmenopausal women are permitted to learn and practice the Navajo chantways and holiness rites (Aberle 1982:227). A similar situation pertains for Pacific Coast Athapaskans, as "among the Hupa the chief thing that contaminates the world is menstrual blood. This belief in the contaminating influence of menstrual blood is a fundamental concept running through much of Hupa religion" (Driver 1941:29).

Strict male avoidance of childbirth is associated with a similar concept of spiritual contagion (capable of causing physical disease to men) among the Dena'ina, Upper Tanana, Gwich'in, Chipewyan, Slavey, and Chiricahua Apache. Women in these societies are respected for their spiritual strength allowing them to withstand this natural danger (Perry 1983:725). Among the Chipewyan, this belief extends to the physical realm, as one male informant maintained that men are the weaker sex and that one woman has the strength and endurance of two men (Abel 1993:22).

> Although European observers later interpreted these taboos as evidence of women's inferior status in Dene society, Dene women themselves did not see them this way. Menstruation was the sign of a potent power particular to women, and from a sense of responsibility to the community, women felt obliged to be cautious and to avoid causing harm at those times (Abel 1993:21).

Having summarized the ethnological evidence for proto-Athapaskan culture, Chapter 2 will now conclude with a brief review of the classical literature in Athapaskan physical anthropology.

Physical Anthropology and the Athapaskans

Background

The distinctively Asian appearance of many Athapaskan speakers has been recognized for many years, and early biological anthropologist Aleš Hrdlička (1925:494)

was quick to suggest that this “virile brachycephalic type” represented a later wave of migration from Asia than the other so-called Indian groups. Yet biological studies attempting to differentiate Athapaskan populations from their non-Athapaskan neighbors falter on the premise that contemporary ethnolinguistic cultures are static, fixed in their ancient residence, and possessing of an enduring racial component. On the contrary, it is abundantly clear that multiple languages with fundamentally different geographical origins may co-exist within a single biological population, and simultaneously peoples with different biological histories may share in common a single, roughly homogenous ethnolinguistic culture. Wherever Athapaskans have resided in close proximity to non-Athapaskans, there has been frequent intermarriage across linguistic boundaries and diffusion trends which are subject to change generationally.

For example, in British Columbia, where Nuxalk (Salish and Bella Coola) peoples and Athapaskans have been neighbors for centuries, a significant number of proto-Athapaskan loanwords in Nuxalk languages suggest the prestige of Athapaskan languages in the region was very high in prehistory, and asymmetric bilingualism favored the expansion of Athapaskan languages into non-Athapaskan populations. Subsequently, the status of two major ethnic groups has shifted radically, so that the acculturation gradient essentially reversed itself in recent centuries, with the prestige associated with Nuxalk languages becoming much higher than Athapaskan. Thus, in later generations, the dominant flow was of Salishan loanwords into Athapaskan languages like Carrier and Chilcotin, and the ‘bilingualism differential’ began to favor the expansion of Salishan groups over Athapaskan ones (Nater 1994). The implications for

human biology are clear—the Subarctic-Plateau boundary does not define biologically distinct populations, but is a fluid cultural frontier within a single gene pool.

Even as ethno-linguistic frontiers appear to be sharply defined by different physiographic zones (Arctic, Subarctic, Plateau, etc.), there have invariably been shifting patterns of multilingualism across these frontiers. Ernest Burch and Thomas Correll posed the question regarding the natives of Northern Alaska. “Are individuals with an Athapaskan father and an Eskimo mother Indian *or* Eskimo? Are groups who spend half the year inland and the other half on the coast inland *or* coastal?” (Burch and Correll 1972:19; emphasis original). There are profound cultural differences between language communities, but these are subject to change rapidly; innumerable discontinuities in the late prehistoric archaeological record bear this out. Prior to the Athapaskan expansion, the protolanguage occupied a small homeland (or beachhead) whose periphery may have included any number of obscure American Indian neighbors whose languages are unknowable (apart from an opaque substrata) but whose peoples influenced the eventual biological and cultural makeup of the mobile Athapaskans. Burch and Correll note, regarding the Athapaskan-Eskimo frontier in North Alaska:

> If someone travelled to another region, he could communicate through the local dialect, or use his "home" dialect with nearly equal fluency - as he chose. He thus maximized or minimized social barriers through linguistic devices according to the requirements of the situation. . . . For example, offspring of mixed Koyukon (Athapaskan) - Inupik (Eskimo) marriages on the upper Kobuk River typically had the choice of passing as Indian or Eskimo simply on the basis of the language that *they decided* to speak, and this could vary from one set of circumstances to another (Burch and Correll 1972:24; emphasis original).

Recent generations have witnessed the ‘conversion’ of entire bands of Athapaskans to the native linguistic culture of their neighbors. For example, by 1900, the Athapaskan residents of the bilingual village of Kvygympaynagmyut overwhelmingly

favored Eskimo language for everyday use outside the home, and frequently intermarried with their Eskimo neighbors; there were consequently fewer than 20 speakers of their Kuskokwim dialect of Deg Hit'an remaining in 1978 (Snow 1981:602). The same situation pertains for the Tagish language (or dialect of Nahanni); by the 1880s Tagish were essentially considered to be an Inland Tlingit band, Athapaskan in its cultural roots but no longer in language. By 1974, only one or two Tagish elders could remember any of their native Athapaskan language, while fluency in the distinctive local dialect of Tlingit was commonplace (McClellan 1981:481). Such band-'conversions' must have occurred in prehistory too, introducing genes from Athapaskan speakers into nearby non-Athapaskan populations. The protracted circumference of any major Athapaskan bloc may have seen particular groups shift linguistic identity multiple times. If the cultural capital of Northern Athapaskan speakers was much higher in the past (as it seems was definitely the case on the Subarctic-Plateau frontier) then it is very likely that non-Athapaskan peoples were assimilated to the linguistic culture of the intrusive Athapaskans, in the reverse of the process described for the Tagish and Deg Hit'an above. Such appears to have been the case for the Southern Athapaskans.

Apacheans have expanded their ranks by liberally assimilating local peoples; their southern incursion apparently served to amalgamate a loose network of pre-Athapaskan hunter-gatherer societies in the greater desert Southwest under one cultural banner; this is evidenced by the incredible speed with which they inflated their ranks from modest foundations and claimed vast territories which had been continuously occupied by others (Upham 1984:250). This is borne out in recent molecular genetic studies which suggest that the Apacheans liberally recruited and

assimilated small groups of "socially and economically marginalized peoples . . . living on the Puebloan fringe" (Malhi et al. 2008:419). A similar means of demographic expansion was apparently employed by Pacific Coast Athapaskans, albeit less rapidly and on a slightly smaller scale (Jacobs 1937). Regarding the inherent biological or racial character (or the lack thereof) of these Athapaskan assimilators, the assessment of Franz Boas is still as relevant today as it was seven decades ago.

> It is true that wherever we find two tribes speaking affiliated languages there must have existed blood-relationship; but we have abundant proof showing that by infusion of foreign blood the anatomical types have changed to such an extent that the original type has been practically swamped by the intruders. Such is the case in North America among the Athapascan tribes of the Southwest. . . . The laws according to which anatomical types are preserved are not the same as those according to which languages are preserved, and for this reason we must not expect to find the results of classifications based on these two considerations to coincide (Boas 1940:153).

The effect of cross-cultural unions has been to 'alloy' the local populations of two different linguistic stocks, hence appearing biologically much closer to each other than either one is to far flung members of the same stock (e.g. accelerating biological divergence between Athapaskans in different geographic blocs), even as cultural differences between them may be preserved or even strengthened. To the extent that biology and language are correlated, the signal is thus weak and not easily detectable at large geographic scales; linguistic boundaries are no significant barrier to gene flow (Hunley and Long 2005; Wang et al. 2007). Do these confounding scenarios prevent any rational discussion of the distinct biological origins of the Athapaskan languages? Not necessarily, if we are mindful of all the historical uncertainties. The relationship between genes and languages may be subtle and complex (Wilson 2008:271). Intense interethnic admixture appears to be the rule rather than the exception (at least in the

North American case), and so researchers should learn to expect it, rather than to treat it as an anomaly or a confounding variable. It is to be expected should be acknowledged as such.

Regarding genetic differentiation (or lack thereof) along the Athapaskan/Algonkian continuum in the Subarctic, Christopher Meiklejohn (1977) notes that the internal structure of biological units in the Subarctic is only of a fleeting reality. Gene flow immediately overrides incipient deme formation, reflecting the existence of an:

> apparent paradox with populations that are both locally inbred and regionally outbred at the same time! . . . The implications for long term deme structure among Athapaskans are considerable. I severely question whether effective demes beyond those ephemerally observable at one point in time occur. . . . The operation on group size constraints in conjunction with interband social cohesion will ensure that local isolates fail to survive. Beyond this, restrictions upon group cohesion wrought by the boreal forest ecosystem will ensure further disruption and effective gene spread. . . . Short term genetic study results must be viewed as a narrow slice in a complicated temporal continuum in which long term gene flow will override the fleeting face of differentiation (Meiklejohn 1977:109-110).

The implication of Meiklejohn's argument is that, where population density is low, cultures easily shift back and forth between endogamy and exogamy as circumstances demand.

Biometrics and Craniofacial Analysis

In pioneering work, Harry Shapiro (1931:378) observed that within-group variation among different so-called Eskimos was much greater than the between-group variation between specific bands of Eskimo and Athapaskan Indians. Anthropometric data suggested that the Chipewyan near Hudson's Bay (central Canada) and the distant Eskimo of Seward Peninsula (northwest Alaska) were essentially one biological population, even though they have no linguistic heritage in common. George Neumann (1952:27-29) in a broad survey of biometric data, postulated a 'Deneid' physical type

which included Northern and Southern Athapaskans, Northwest Coast and Plateau Indians, and Yupik Eskimos. Aleutian Islanders represent one extreme in the range, and ultimately diverge from the 'Deneid' continuum, suggesting that southwest Alaska could be the beachhead for this physical type within the continent. Neumann's data excluded a small percentage of Athapaskan and Haida crania which fell within the range of variation for eastern woodlands populations, suggesting the possibility of horizontal language transmission (i.e. the spread of Na-Dene languages to non-Na-Dene peoples), and that earlier, less specialized populations were absorbed by later more specialized ones. However, the vast majority of his 'Deneids' are Athapaskan speakers and the vast majority of Athapaskan speakers are classified as Deneids. Furthermore, the 'Deneid' type is more strongly associated with a putative Central Asian source population than is any other group:

> the bulk of this group is associated with the expansion of speakers of languages of the Athabaskan stock. It is hardly necessary to point out that a linguistic and physical correlation will not prove to be too high. There are also Skittagetan, Wakashan, Penutian, and other groups that are Deneid. . . . It represents one of the last of the major migrations to the New World, it is the group that exhibits the most marked Asiatic connections, it exercised profound influences on both North Pacific Coast and Southwestern cultures, . . . from perhaps A.D. 1200 onward (Neumann 1952:28).

Neumann's 'Deneid' physical type corresponds almost exactly to the distinct Northwest Coast/ Na-Dene dental pattern noted by Greenberg, Turner and Zegura (1986). Building upon earlier work, Christy Turner and Richard Scott (2007) maintain that the 'sinodont' dentition of Eskimo-Aleuts and Na-Dene/Subarctic/Northwest Coast peoples are distinct enough from each other and from the rest of Native Americans to suggest that the Na-Dene and Eskimo-Aleut must represent two independent

migrations, more recent than others in the continent. Regarding the physical similarity of Deneid crania to those of Lake Baikal in Siberia, Neumann (1952) continues:

> It is quite certain that a considerable part of the wave of people that became the Deneids in North America must have remained in the Transbaikal area. . . . This would explain the existence of a complex of morphological traits common to many groups extending from Lake Baikal to the Aleutians, and from there south to the Apache of Arizona and New Mexico (Neumann 1952:29).

As the history of the relevant populations has become better defined by archaeology, a paradox has emerged. The problem is that the biological populations in which these profound phenotypic similarities appear (that is, the common traits of 'Deneids' and Southwest Siberians) are not shown to have great antiquity in their present locations. This dilemma is cogently expressed by Alexander Kozintsev et al.:

> Contrary to expectation, the earliest known inhabitants of the Baikal area, who lived there in the sixth and fifth millennia BC, were extremely flat-faced Mongoloids. Their descendants began to look less Mongoloid (and accordingly more Amerindian) only in the fourth millennium BC, and this tendency continued in the 3d millennium BC. . . . Clearly, the only possible explanation is gene flow from the more western regions of southern Siberia inhabited by the Caucasoids. The resulting similarity of late Baikalians with the Amerindians, then, is superficial (Kozintsev et al. 1999:194).

There are two competing theories regarding the human biology of Central Asia, whose populations (like American Indians) are physically intermediate between the so-called 'mongoloid' and 'caucasoid' phenotypic extremes of east and west Eurasia. The 'admixture' hypothesis suggests that the Bronze Age witnessed a convergence of specialized eastern and western types in the Eurasian heartland, and this convergent/admixed Inner Asian phenotype is fortuitous and only superficially similar to that of many of America's native peoples. Alternatively, the 'hearth' hypothesis reverses this hypothetical gene-flow gradient, suggesting the eastern and western phenotypic extremes represent the culmination of long processes of divergence and diversification

from a centrally located intermediaries in a largely undifferentiated Eurasian source population (i.e. the 'hearth'), ancestral to all three groups (so-called caucasoids, mongoloids and americanoids). Doubtless both hypotheses have kernels of truth, and the actual process may have been one of pendulum-like movements of peoples in and out of the Eurasian heartland—just as back and forth movements in the north Pacific Rim are also feasible. Kozintsev and colleagues ultimately favor an intermediate scenario, whereby the Bronze Age Okunev and Sopka peoples of the Yenisei and Ob headwaters of Southwest Siberia are 'collateral relatives' of American Indians, sharing a direct common ancestor, yet who nonetheless appear (unlike their North American kin) to have been thoroughly admixed with west Eurasian caucasoids during the Bronze Age (Kozintsev et al. 1999).

The phenotypes of Northwest North Americans and Central Asian populations evidently developed in tandem since the Bronze Age. Some of this development can be attributed to uniform responses to environment and the plasticity of phenotypes in both America and Siberia:

> ancient groups [are] mostly characterized by broad face and wide orbits, . . . [more so] than modern ones . . . regardless of origin. . . . This vector, then, reveals a universal diachronic tendency (evidently related to the gracilization phenomenon) and is accordingly irrelevant for tracing genetical affinities (Kozintsev et al. 1999:200).

However, such a parallel 'drift' of phenotypes in response to environmental stimuli is not sufficient to account for the overall degree of physical similarity between Late Holocene East Central Asian (ECA) peoples and the peoples of the Americas, and for the suddenness of its appearance. But efforts to connect 'Deneid' and Late Holocene Baikallian biometrics are complicated by the historical heterogeneity of populations in both regions—uncertainty is pervasive and a satisfactory resolution is not immediately

forthcoming. Nonetheless, craniometric analyses using traditional methods yield a clear consensus that some degree of Late Holocene intercontinental migration is the best explanantion for the post-Neolithic convergence between Asian and Native American phenotypes; the suddenness of the Late-Holocene morphological changes are more consistent with dispersal from Asia rather than evolution in situ, as González-José et al. point out:

> In summary, craniofacial studies seem to support a scenario in which America was successively occupied by two morphologically differentiated human populations, with the generalized (e.g., Paleoamerican) morphology first entering the New World and being replaced or assimilated by groups carrying derived traits (González-José et al. 2008:177).

Physical anthropologists for the better part of a century have agreed that the biometric data support multiple migrations out of Asia into America. It has only been with the advent of molecular genetics that this view has been significantly challenged by contemporary scholars. Chapter 3 will address cutting-edge linguistic and molecular genetic evidence, in the context of comparative ethnology.

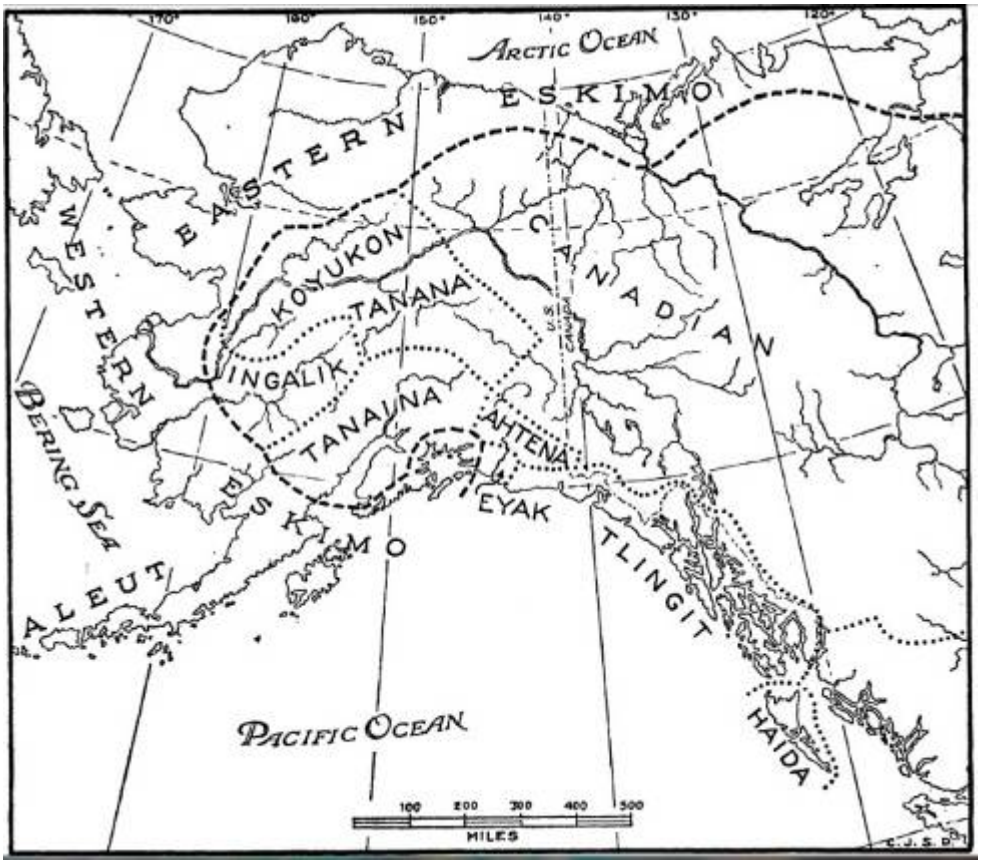


Figure 2-1. Na-Dene in the Northwest (from Dumond 1969:859).

CHAPTER 3
THE DENE-YENISEIAN FAMILY IN ANTHROPOLOGICAL PERSPECTIVE

Pushing the Linguistic Boundaries: the Dene-Yeniseian Phylum

The cutting edge in Athapaskan studies is embodied by the work of the February 2008 Dene-Yeniseic Symposium at the University of Alaska, Fairbanks. This symposium included a large contingent of the world's leading experts on Athapaskan languages and Athapaskan archaeology, and was convened for the sole purpose of evaluating nearly a decade of research conducted by linguist Eric Vajda (at University of Western Washington) demonstrating the possibility of a historical relationship between Athapaskan, Eyak and Tlingit on the one hand, and the Yeniseian languages on the other. 'Dene-Yeniseian' is now positioned to gain widespread recognition as the first Asian-Amerindian language family, a remarkable feat considering that Yeniseian people reside in South Siberia and Central Asia, ~7000 miles away from the nearest Alaskan Athapaskans. The symposium and the publication surrounding it arguably represent the beginnings of a paradigm shift in Americanist anthropology, as self-described skeptics are seriously considering long-distance genetic relationships between particular Old World and New World cultures, after decades of staunch opposition to similar proposals. Bernard Comrie introduces the symposium's work in a recent volume of the *Anthropological Papers of the University of Alaska:*

> In the literature there have been various proposals concerning genealogical relations between languages of the Americas and of Siberia. So far, these proposals have not succeeded in convincing the majority of specialists working on languages of the Americas nor those working on languages of Siberia, nor those working in historical-comparative linguistics. The importance of Vajda's work on the Dene-Yeniseian hypothesis is that for the first time evidence for a geneaological relationship between languages of the America and of Siberia has been presented (excluding, of course, the case of Eskimo . . .) which not only satisfies the methods of historical-

> comparative linguistics but also succeeds in convincing skeptics like me (Comrie 2010:35).

A global literature review of the background to the Dene-Yeniseain hypothesis is presented by Vajda (2010b), so there is no pressing need to cover the same ground. Nonetheless, a brief sketch of some important milestones in English-language literature is helpful, to illustrate that Dene-Yeniseian represents a refinement (rather than a replacement) of earlier proposals, and is the culmination of a long history of scholarship.

Yeniseian, Tibetan and Na-Dene

Yeniseian language is now critically endangered; the Ket of western Siberia are the only remaining members of this previously wide-ranging family, and the number of fluent speakers is less than 100. The question of the geneaological status of Yeniseian languages in Eurasia has intruigued scholars for generations. As a linguistic isolate, they are often grouped for convenience with the Paleo-Asiatic languages of the Russian Far East (Chukotko-Kamchatkan, Yukaghir, and Nivkh), although they have virtually nothing in common with them. Paleo-Asiatic (or Paleo-Siberian) is really a 'dustbin' category for unclassified languages—the designation simply indicates a possibility that Yeniseian languages were present in Siberia before the expansion of 'Neo-Siberian' reindeer pastoralism that took place during the Common Era. In terms of their possible geneaological affinities, a stronger case can be made for a relationship between Yeniseian and the languages of East Central Asia to the south, than between Yeniseian and other languages of Siberia, 'paleo' or otherwise. Affinities with Tibetan in particular have been remarked upon by many. One of the earliest to do so in print was James Byrne, who wrote using data collected when multiple Yeniseian languages were still spoken. Describing Ket and Kott (now extinct), he wrote:

> The internal changes which the stems of nouns and verbs undergo in these languages, and which make them so unlike the other [Siberian] languages . . . , are points of resemblance to the [Chinese and Tibetan] languages . . . ; those of the verb especially having a certain resemblance to the structure of the Tibetan verb. And it is remarkable, that the numerals of both languages [Ket and Kott] resemble the Tibetan numerals. . . . It seems most probable, therefore, that these languages are originally akin to the Tibetan, and have been altered by mixture with the Siberian languages (Byrne 1885:472).

Sapir (1925, 1991) and Shafer (1952), using the historical-comparative method, both suggest geneaological relations between Na-Dene and Tibetan based largely on similar verb morphology as described above. There is three-way structural resemblance between Yeniseian, Tibetan and Na-Dene verbs. A cadre of mid-twentieth-century Soviet linguists were instrumental in advancing the hypothesis of Yeniseian-Tibetan language links under the auspices of the multilateralist Sino-Caucasian proposal, which included also the North Caucasic languages and eventually Na-Dene too (Starostin 1991). But American archaeologst Henry Collins (1954:35-36) was likely the first to suggest that the Yeniseian languages could be a Siberian intermediary family between Sino-Tibetan and Na-Dene, and that Na-Dene and Yeniseian could have a special relationship. A similar theory was advanced by Merritt Ruhlen (1998), who formally proposed the Dene-Yeniseian family:

> Although I do not question that Na-Dene is related to both Sino-Tibetan and Caucasian (within the larger Dene-Caucasian family), . . . the evidence presented below indicates that Na-Dene is more closely related to Yeniseian than to either of these other two families (Ruhlen 1998:13994).

Ruhlen's publication in a high-profile venue (*Proceedings of the National Academy of Sciences*) generated considerable attention in the scientific community, but his work was not well received by the linguists of the historical-comparative school, because Ruhlen's work is based in the discredited multilaterial-comparative method prescribed by Ruhlen's mentor Joseph Greenberg (1987).

However, Ruhlen's work *did* inspire Eric Vadja to dig further into the problem using more rigorous orthodox methods, and Vajda's (2010a, 2010b) work has since been well received by a majority of specialists. Whereas Sino-Dene and Dene-Sino-Caucasian both met with controversy, it is now safe to say (thanks to Vajda's exacting work) that Dene-Yeniseian is rapidly gaining widespread acceptance. As far as validating the multilateral-comparative method, the question remains open. A judicious statement would be that this method can generate interesting hypotheses (like Dene-Yeniseian), but that traditional methods must still be used to prove them (Michalov et al. 1998:465).

In contrast to Ruhlen's proposal (which suggested a Dene-Yeniseian branch, including Haida, on the Dene-Caucasian tree), Vajda's proposal does not assume that Dene-Yeniseian is necessarily related to Haida or Sino-Tibetan. This narrower view of 'Dene-Yeniseian' includes only Athapaskan, Eyak, Tlingit and Yeniseian, although Vajda does report one "triple-resemblance in protoforms" which he calls "striking"; the word *liver,* Yeniseian: **sə̆'ŋ*, Na-Dene: **sənt'*, Sino-Tibetan **m-sin* (Vajda 2010b:114); for additional Sino-Yeniseian comparisons, see Sedláček (2008). Regarding the possible inclusion of Sino-Tibetan and Haida in particular, Vajda writes:

> Though I have excluded Sino-Tibetan from the present study due to difficulty in assessing historical Tibeto-Burman verb morphology, I would single it out as a promising potential relative of Yeniseian and Na-Dene. . . . My comparison of Yeniseian and Na-Dene failed to turn up new evidence in favor of linking either family with Haida. If Haida is indeed related to Athabaskan, it would appear to be at time depth older than the link between Yeniseian and Na-Dene (Vajda 2010b:114-115).

Sino-Tibetan and Haida remain the two most plausible candidates for more distant relatives of the established Dene-Yeniseian family, but it is unclear if Haida or Sino-Tibetan is closer in this regard (Figure 3-1).

Implications Regarding the Athapaskan Expansion

The great geographic gulf between Yeniseian and the other members of the family means we can no longer assume that Na-Dene familial diversification has taken place entirely within the New World. The point of departure between nearest common ancestors may be anywhere on the long (possibly indirect) journey between southwest Siberia and Alaska. When this occurred is an open question. Traditionalist linguists generally argue that the maximum time-depth for the useful application of the comparative method is between 4000 and 6000 years, a range within which most well established linguistic stocks are comfortably placed (Matson and Magne 2007:133). Few anthropologists would place stock in lexicostatistics as a means for establishing firm dates, but the approximate cap of 6000 years is still widely assumed as a terminus ante quem; when the loss of core vocabulary becomes too great to allow determination of genetic relationship. The strength of the Dene-Yeniseian connection (now generally acknowledged) is an apparent exception to this rule, because the physical gulf seems too great for a historical relationship within these timeframes. But this opinion is conditioned by non-linguistic evidence (both archaeological and genetic) which is subject to a variety of interpretations. It is also feasible that Dene-Yeniseian cultural-historical relations are within the established 4000-6000 year window for the utility of lexicostatistical methods, but that the material culture traces of this relationship remain elusive.

The geographic span between the two branches (Yeniseian and Na-Dene) constitutes the largest (and possibly the fastest) pedestrian language spread on earth. Johanna Nichols thus claims the Dene-Yeniseian family appears plausible “on statistical grounds” but is nonetheless “geographically problematic” (Nichols 2010:299). Some

regard a very slow migration rate as more likely and see the spatial gulf in the Dene-Yeniseian family as necessitating many millennia to transpire. James Kari asserts: "[t]he Dene-Yeniseian language stock renders the short Na-Dene chronology obsolete" (Kari 2010:210). But Kari also insists that the Na-Dene languages have been present in North America for more than 10,000 years. This hypothesis of in-situ American diversification of Na-Dene greatly exacerbates this implausibility in geographical terms.

Joseph Greenberg included Haida in his 9000-year chronology for the development of Na-Dene (Greenberg et al. 1986). This long chronology was adopted by archaeologists to support the identification of Archaic American microblade users as "Na-Dene" prior to 7000 years ago (Sutton 2008:84). The recognition that Yeniseian is closer to Na-Dene than either language family is to Haida challenges this model, as lexicostatistical divergence between Tlingit and Athapaskan may be less than 3500 years (Kaufman and Golla 2000:52). Even this divergence process could have begun anywhere between interior Eurasia and Alaska. If Na-Dene and/or Yeniseian peoples were highly mobile latecomers into one or both of their respective territories, then the geographical implausibility of the family is mitigated rather than exacerbated. There is a strong possibility that the historical range of the Yeniseian languages was much greater in Eurasia during the past.

The Historical Range of Yeniseian Speakers

Although recent Ket have resided in central Siberia northward to the Arctic Circle, the six or seven extinct Yeniseian languages were spoken considerably to the south as far as the headwaters of the Yenisei and Ob rivers, northwest of Lake Baikal, all within the last 300 years. The few hundred remaining Ket reside on the middle reaches of the river, but at least four of the extinct Southern Yeniseian languages (Kott, Assan, Arin, &

Pumpokol) were distributed considerably to the south along the upper reaches of the Yenisei as early as the mid eighteenth century; these headwaters and tributaries immediately northwest of Lake Baikal are precisely where hundreds of 'americanoid' Okunev burials were found, all from the Bronze Age between 3500-4500 years old (Kozintsev et al. 1999:197). Furthermore, a great swath of territory to the south and west of these lands (in modern Finno-Ugric, Samoyedic, Turkic and Mongolian territory) shows frequent or occasional Yeniseian toponyms and evidence of former widespread bilingualism between Yeniseian and Turkic. In the Lena Basin and the considerable territory to the west, recent incursions by Neo-Siberian pastoralists have obscured any such toponyms and/or linguistic substrates; the possible Yeniseian language history in this greater region is unclear (Kari and Potter 2010:8-10). The southerly origin of Yeniseian languages is likely based on present data; the pre-Metal Age peoples of the region do not posess strongly 'americanoid' physical traits.

Furthermore, there is reason to suspect that a southern Yeniseian language may have been the elite language of the Xiongnu Empire (a.k.a. the eastern Huns) since the only surviving Xiongnu materials in Old Chinese transcription (consisting of one sentence and about two-dozen scattered words) show remarkable affinities to Yeniseian grammar and basic vocabulary (Pulleyblank 1962:239-265; Vovin 2000, 2003). At the very least, the Xiongnu likely included Yeniseian tribes in their confederacy along with Scythians, Turks and Mongols. The ancient range of Yeniseians as equestrian nomadic confederates of the Xiongnu would have been enormous, encompassing southern Siberia, Chinese Turkestan, Inner and Outer Mongolia eastward nearly to Manchuria and the maritime provinces of the Russian Far East (Figure 3-2). Generationally shifting

patterns of multilingualism are the norm in such large, multiethnic tribal confederacies. Michael Fortescue (with a hint of skepticism) summarizes 'conventional wisdom' on the subject of Yeniseian origins:

> Yeniseians, today hunters of the taiga, were supposedly drawn into the Hun union some two thousand years ago and subsequently displaced into the Sayan region [the Altai Mountians], where they remained until the expansion of the Mongolian empire pushed them still further north . . . peripheral to the spread zone 'highway' of the Eurasian steppes, . . . drawn into the fast traffic, later to be spun off again. . . . The linguistic links to Na-Dene . . . suggests rather that they have been present in Siberia for a very long time indeed. Certain 'Americanoid' physical traits of the Yeniseian people have been remarked upon (Fortescue 1998:56, n.23).

However, contrary to Fortescue, I suggest the 'conventional wisdom' in this case is consistent with a preponderance of the physical traits, which shows southern Siberian 'americanoid' phenotypes to be a product of Bronze Age admixture (Kozintsev et al. 1999), and consistent with demonstrable processes of Central Asian state formation and disintegration. Despite the romantic desire of twentieth-century anthropologists (like Mircea Eliade) to find concrete ethnological ties between contemporary Siberian natives and their Paleo-Asiatic forebears, it appears that many Native Siberians have concrete, historical roots in the cosmopolitan Eurasian heartland, which was a population reservoir. It was the shattered relicts of failed states and empires which flew cyclically into the unforgiving climate of North Asia:

> The devolution, or more accurately the disintegration, of Inner Asian states in this region is well documented. It is not always realized what follows from this, that many of the tribal peoples of Eliade's time had been imperial rulers some centuries before. The Mongols are the most famous of these. There also are the examples of the Khitans and Jurchens, the ruling elites of the Liao (tenth through twelfth centuries) and Jin (twelfth and thirteenth centuries) empires respectively, whose descendants became the impoverished peripheral tribes of early twentieth-century ethnography (Humphrey 1994:195).

The southern origins of the Yeniseians may likewise be inferred on the basis of linguistic evidence, particularly loanwords into Yeniseian from southern languages which are no longer contiguous with them. Just as the physical anthropological evidence points to South Siberia as a multiethnic melting pot, so too an admixture scenario may well explain many disparate features shared between Yeniseian and Sino-Tibetan languages, which could reflect ancient and intensive borrowing (Behr 2003:176) as easily as pre-Neolithic Tibetan-Yeniseian common genealogical descent (Ruhlen 1998; Sedláček 2008).

> Both phonologically and morphologically the contrast between Kettish and Kottish on the one hand and Chinese or Tibetan on the other could scarcely be greater. . . . There are a few striking word comparisons but these may well be explicable by early borrowings, especially if it should turn out that the Yenisseians and the Chinese were once contiguous (Pulleyblank 1962:243).

Hundreds of apparent Sino-Tibetan cognates have also been identified in Na-Dene (Bengtson 1994; Sapir 1991; Shafer 1952). The most striking Sino-Dene typological parallelism identified by Sapir is the well developed tone system found in Athapaskan, Tibetan and Chinese (Sapir 1925); Yeniseian is also a tonal language (Comrie 2010:31). However these tone systems are not particularly ancient and have not been reconstructed in any of the relevant protolanguages (Bengtson 1994:210). The genesis of the tone systems in at least some of these languages may have been contact-induced, indicating some degree of non-genetic mutual influences. Ethnological parallels between Athapaskans, Siberians, and East Central Asians also seem to favor strong late prehistoric ties between the continents (Mortensen 2006). Dene-Yeniseian languages should be viewed in this context.

Asian-Athapaskan Ethnological Links

Chapter 2 outlined some features of Proto-Athapaskan society, using the method of ethnographic reconstruction (building upon Perry 1983, 1989). These areas include pervasive beliefs about eschatology (death and the afterlife), femaleness (female puberty rituals and childbirth practices), and social organization (matriliny and matrilocality). In this section, I will draw parallels in each of these areas to similar practices in Asia, found among Native Siberians and Central Asians. Yeniseian data will be included whenever possible, although in Siberia (as in North America) culture traits are rarely neatly bounded by language family. In addition to the above categories, I will address another one of Perry's (1983) proto-Athapaskan cultural traits; specific forms of extrasomatic power, especially relevant to transpacific links, with further relevance to the cultural importance of projectile weapons technology.

Eschatology

Siberian antecedents for Proto-Athapaskan eschatology are numerous and detailed. The multipart soul is a widespread feature of Siberian shamanism from the Altai to the Chukchi Peninsula (with the component 'parts' generally numbering between three and six). Particularly the Samoyedic Nentsi of the lower Yenisei valley in North Siberia possessed a belief in a three-component soul where two of these components are virtually identical to the proto-Athapaskan shadow-soul and breath-soul (the third part being the intellect). Just as among most Athapaskans, the Nentsi shadow-soul is considered malign (capable of returning to molest the family) and the breath benign. Furthermore, Nentsi practiced strict name taboos and destroyed the possessions of the deceased (leaving them at the gravesite) and burned the deceased's house in a manner precisely analogous to common Athapaskan practices (Perry 1983:728). Among

Southern Athapaskans, the thoracic organs (heart-lungs-liver) are considered to be just one super-organ, so the action of breath is a function of the working heart (Baldwin 1997:27). The Northeast Siberian Yukaghir and neighboring Polar Yakut both have the same three-soul model as the Nentsi, with the intellect, shadow-soul, breath-soul/heart-soul. Like the Navajo and Apache, they conceive of breath as the action of the working heart. Furthermore, these two neighboring Siberian groups both believe in human-to-human reincarnation within family lineages (Jochelson 1910:158-161). Similar reincarnation beliefs are found among many Athapaskans.

Most Na-Dene (like some Eskimo groups) also believed that at least a portion (usually the breath/wind) of the human soul was capable of rebirth or reincarnation in the terrestrial sphere. This by itself is unremarkable, as rebirth/reincarnation eschatologies are common the world over, including many indigenous groups and small-scale societies. The importance of Athapaskan, Northwest Coast and Eskimo reincarnation beliefs lies not in their mere existence, but rather in their pervasiveness and complexity in comparison with those of similar small-scale societies; in both of these respects they show unexpectedly strong similarity to the complex societies of Central Asia. Generalized animistic beliefs are widespread among indigenous peoples, but they are less commonly conjoined with reincarnation beliefs. Gananath Obeyesekere examines the reincarnation beliefs of several northwestern American Indian societies, including Carrier and Beaver Athapaskans, Tlingit, Haida and (Tsimshianic) Gitxsan. He observes “Their theories have an underlying ideological resemblance to South Asian religions . . . in the view that animals and even plants are

endowed with consciousness" (Obeyesekere 2002:38-39). They are thus distinct from the reincarnation beliefs of other small-scale societies:

> the only empirical cases similar to the Buddhist among small-scale societies outside the Indic area are those of the Northwest Coast Indians [including Athapaskans] and Inuit, because the Igbo and other West African groups and the Trobriand Isanders have no notion of animal rebirths. . . . One cannot therefore totally discount the idea that the circumpolar distribution of these rebirth eschatologies might well have extended from Siberia down into Central Asia and then to the Indian subcontinent (Obeyesekere 2002:89).

Obeyesekere does note one difference between northwestern Native American reincarnation eschatology and that of the Buddhists Asia; "when the great Indic religions emerged into history they had another key doctrine *in addition to the doctrine of rebirth, namely that of karma,* a system of ethical intentions that decide the nature of rebirth" (Obeyesekere 1994:xix; emphasis original). Obeyesekere maintains that India's karmic eschatology was developed from a small-scale antecedent very similar to Athapaskan rebirth eschatology. But Buddhism and its ilk developed this basic template into a hierarchical cosmology (with animals ranked below humans) and an ultimate concern with cosmic justice, typical of the organized religions of many complex stratified societies. In contrast, the notion that rebirth into a lower station is punishment for actions in life, is quite alien to members of small-scale animistic societies (for whom different orders of existence are not rigidly stratified).

Religious laws governing punishment and reward after death linked to ones' behavior in life are a general feature of highly stratified state-level societies. Obeseyekere's model thus distinguishes Indic eschatology from simple rebirth in most small-scale societies. However, there are a number of exceptions to this tendency which seem to indicate the possible influence of the organized religions of Eurasian

states upon the circumpolar shamanism complex. Complex eschatologies from the Eurasian hearth may have spread gradually to Siberia and thence to North America. Buddhist missionaries among the Xiongnu were active circa 2000 years ago, and the one surviving fragment of Xiongnu text (with strong Yeniseain affinities) was transcribed by Futo Cheng, a Buddhist monk (Vovin 2000:95). Buddhist elements of the north Asian shamanism complex have long been recognized; one theory maintains that the Evenki word *shaman* itself is a Buddhist idiom, derived from the Sanskrit word for "monk" *śramana* (Mironov and Shirokogoroff 1924). This view has been lately substantiated by textual evidence showing that the word *shaman* could mean either "medicine man" or "monk" in ancient Turkic languages, depending on the context (Zieme 2008). Ian Stevenson argues that karma-like concepts and specific taboos among the (Dene-Yeniseian) Tlingit are probably indicative of Buddhist influence:

> In addition to the belief in reincarnation itself and in a concept somewhat similar to that of karma linking one life with another, the Tlingit have two other significant ideas with regard to reincarnation. First, they believe that children who remember their past lives are fated to die young and they endeavor to discourage a child who claims to remember a previous life from doing so. An identical belief exists in India, where families of such children frequently make strenuous efforts to suppress the apparent memories of a previous life told by a child. Secondly, the Tlingits also believe in rebirth as contrasted with reincarnation. According to the concept of rebirth, the old personality gives rise to the new as a candle burning low may light a new candle and so continue the series. In reincarnation, on the other hand, the same personality continues, although changed by the circumstances of the new life. Reincarnation as thus defined is a concept of Hinduism and rebirth a concept of Buddhism. . . . The close similarities between the ideas on reincarnation among the Tlingits and Buddhists also suggest that the ancestors of the Tlingits imported rather than invented their ideas on reincarnation (Stevenson 1974:222).

That a concept similar to karma survived within the socially stratified societies of the Northwest Coast is fathomable; social stratification has existed in the region since ca. 400 BCE. But in the more egalitarian societies of the interior Subarctic, such

concepts would be unlikely to endure. Nonetheless, reincarnation eschatologies are almost universal among Northern Athapaskans, Eyak and Tlingit, and a number of them appear to fit Obeyesekere's 'karmic' pattern atypical for simple societies. Widespread cognate Athapaskan terms for reincarnation (like Gwich'in *natliʔ* and Slavey *ndaadlinha'*) suggest the existence of a Proto-Athapaskan word for the phenomenon (Mills 1994:20-22). Reincarnation beliefs involving both humans and animals are also reported for Navajo, Apache and Pacific Coast Athapaskans (Bourke 1892:470; Haile 1943:87-88; Mills 1994:25; Powers 1877:110).

Obeyesekere (2002:89) notes two different types of animal reincarnation. Parallel reincarnation is the more common type in North America, where reincarnation occurs entirely within species boundaries. Buddhist societies, by contrast, all believe in the second type, cross-species reincarnation (metempsychosis), whereby different orders of existence are placed in a hierarchy and the upward or downward mobility of an individual consciousness is determined by karma. While the 'karmic' type of rebirth is extremely rare among foragers, it does appear occasionally among Na-Dene and Eskimos. This is understandable, as "[c]oncepts of reincarnation in the New World have doubtless continued to be influenced by . . . Siberian shamanism (itself affected by Buddhist belief and practice)" (Mills 1994:20).

Reincarnation among the Athapaskan Kaska is governed by principles of merit-based causality, as among the Buddhists. Kaska share with the Buddhists a coolness toward the prospect of reincarnation to correct life's errors; the truly virtuous are freed from the corporeal body in reward for an honorable life (Honigmann 1954:136-137). Although Navajo eschatology is relatively unconcerned with reward and punishment in

the hereafter, the length of one's life may be affected by virtuous behavior in a previous life. The wind-soul is impervious to change, but the fate of this body is linked to the actions of the wind-soul in past bodies.

> But, if the person has lived an improper life, the same wind may be sent into another human body, which will then only have a short life. If such person had lived a proper life, as indicated by death of old age, that wind soul may again be dispatched into another human body, which also will die of old age (Haile 1943:87-88).

Among the Upper Tanana, "The dead may be reborn in the form of animals. When a hunter meets an animal he is unable to kill, he regards this as evidence of the transmigration of a human spirit into animal form" (McKennan 1959:160). The Gwichin likewise may be reincarnated into a Caribou or another game animal. They consider reincarnation into another human body to be highly auspicious, but to be reborn as a bear is a lamentable tragedy (Petitot 1878:26). The virtuous among the Mattole Athapaskans in California were said to be rewarded with rebirth in a paradise across the Pacific Ocean, while the bad Mattole were reportedly reincarnated as grizzly bears as punishment for their misdeeds, to be hunted and despised by men (Powers 1877:110). A similar belief system is recorded for Apaches, with snakes being the most despised animal and rebirth as a rattlesnake being the just punishment for evil humans (Bancroft 1875:527). The reincarnation of evil humans into lemmings is recorded for the Caribou Inuit, interior-adapted near-neighbors of the Chipewyan on the western shore of Hudson's Bay. The presence of complex Caribou Inuit karmic eschatology belies Rasmussen's regard for these folk as possessing religious ideas "among the most primitive I have found" (Igjugârjuk and Rasmussen 2001:83). Similar statements about the 'primitiveness' of Athapaskan religious beliefs abound in the literature, and Athapaskans likewise defy this stereotype upon closer inspection.

Matrilineal-Matrilocal Social Organization

Ethnographic Ket primarily reckon their kinship patrilineally, but as the sole surviving Yeniseian group, might not adequately represent the language family as a whole. Indeed, the Ket are matrilocal (like most Athapaskans) and folklore and ethnohistory combine to suggest that they too may have been matrilineal in the past (Nikolaev 1985:80-89; Vajda 2001:205). This would be consistent with archaeological views of the South Siberian Neolithic, where DNA lineages clustered in elite burials in the Lake Baikal region are consistent with matrilineal social structure (Mooder et al. 2005:631). Folklore of the Tuva and Khakass people of South Siberia also suggest formerly prevalent matriliny (Dalkesen 2010). Khakass are a Turkic ethnic conglomerate who in recent centuries entirely assimilated both the Arin and Yarin bands of Southern Yeniseians; Khakass cultural fusion includes a quotient of Yeniseians who now speak a Turkic language (Wixman 1984:101). Evidence for pre-modern Yeniseian social structure is relatively scant, but what does exist is consistent with the view that the pattern among Na-Dene speakers could be connected to post-Neolithic South Siberia.

Menstruation and Childbirth

Very similar to California Athapaskans, among the Northern Evenki of Siberia, “women are believed to be perennially threatening polluters of men” (Montgomery 1974:140; see Shirokogoroff 1933). These ideas are also prevalent among the Samoyeds and Ob Ugrians in Northern and Western Siberia (both are Uralic-speaking neighbors of the Ket). They share specific menstrual taboos with Athapaskans, including prohibitions against handling men’s hunting equipment and crossing paths with hunters (Abel 1993:21; Balzer 1981:851; Perry 1983:728).

The Ket themselves have no formal puberty rituals, but do have similar rules forbidding the presence of men during childbirth. As among most Athapaskans, dangerous physical complications are feared whenever a woman is permitted to see a man's face before childbirth. The Ket also retain, long into old age, the umbilical cords of children preserved as amulets in ornately decorated pouches. Kept on the person; these amulets are believed to protect an individual throughout his/her entire life (Lee 1967:44). These same customs are also practiced by Athapaskans in all three geographic blocs. The Chipewyan have the identical custom of preserving umbilical cords in ornately decorated pouches for life, as do the vast majority of Pacific Coast Athapaskans (Abel 1993:20; Barnett 1937:178; Curtis 1928:25-26; Driver 1939:349; Essene 1942:32). Similar or identical customs are found in the Plateau, Northern and Central Plains, among such groups as the Thompson Salish, Nez Perce, Klikitat, Tenino, Umatilla, Blackfoot, Cheyenne, Lakota, Kiowa, Arapaho, and eastern Apache (Howard 1907:17; Ray 1942:199; Sutton 2008:119; Teit 1900:304-305; Wissler 1920:92). Tsuut'ina, Western Apache, Ute and Kwakiutl groups also preserve the umbilical cord in decorated pouches, but only for a finite time, eventually ritually disposing of it during childhood (Curtis 1928:105; Drucker 1950:206; Gifford 1940:158). Figure 3-3 shows an Apache umbilical pouch worn by an adult.

The Ket dispose of the afterbirth by hanging it in a tree (Lee 1967:44). This is the same practice as Northern Athapaskan Carrier and Chilcotin; disposal of the placenta in a tree is also a universal practice among Oregon Athapaskans and southwestern Apaches (Gifford 1940:62; Jenness 1943:30; Ray 1942:195). Non-Athapaskans who follow this custom include Plains Cree, some Oregon Coast tribes, Inland Salish and

their confederates, and (rarely) Coast Salish (Barnett 1937:138; 1938:253; Mandelbaum 1940:241; Teit 1900:304).

Transpersonal Extrasomatic Power of Objects and Animals

Perry notes the pervasiveness in all three Athapaskan blocs of "the attribution of extrasomatic power to beings and objects" (Perry 1983:723). This is an example of a common tendency among Native Americans in general which nonetheless has uniquely Athapaskan manifestations of particular intensity; this power "although it may resemble aspects of some non-Athapaskan cultures, nonetheless is ubiquitous among Athapaskan groups with striking conformity" (Perry 1983:723). This "striking conformity" encompasses the occurrence of essentially identical concepts of bear sickness (a dangerous spiritual affliction brought on through exposure to bears and bear detritus) among the Dena'ina and Western Apache, two groups found at "near extremes within the geographic range of Athapaskan speakers, as well as very different ecological adaptations" (Perry 1983:719). Vaguely similar animistic belief systems are found throughout Siberia, for example among Evenki shamanists, but it is difficult to ascribe historical significance to these more general parallels (Heyne 1999:377, 384).

In the Apachean case, such extrasomatic power is transpersonal in the sense that the actual bear (or snake, or lightning etc.) is not the source of the power but rather the physical manifestation of a primordial essence. To prevent the disease (bear sickness or snake sickness or lightning sickness, etc.) requires homeopathic prophylactics. In the same way that smallpox vaccine includes a controlled form of smallpox virus, so the mastery of extrasomatic power is used as "a safeguard against the very source from which it is derived. To ward off lightning, one needs lightning power; to kill bear, bear power; to cure snake sickness, snake power" (Basso 1966:150). This power is not

limited to animate beings, but is transferrable to intimate objects; lightning-struck trees can be just as dangerous as lightning itself (Perry 1983:723). These same lightning-struck trees are believed to spontaneously produce bifacial lithic artifacts. Such items are viewed by Apacheans as talismans from the sky, and antidotes to lightning power. According to one White Mountain Apache informant, Helen Crocker:

> And they say that when lightning is real hard, you know, just after one another, these rocks come from there. They land in the bark [of lightning-struck trees] or on the ground. They take those. It's used in a prayer, and it's called "from the lightning," nbi'bibish. Nbi is the lightning and bibish is his knife. It's the lightning's knife. It's one [of the] sacred things Indians use. Kept those, and medicine men used it some more in the prayers (Kessel 2005:67-68).

Apachean conceptual associations between lightning and projectile points are strong. Arrowheads or blades (putatively of celestial origin) protect against lightning and, in a complementary manner, wooden amulets carved from lightning-struck trees protect against arrows and bullets (Bourke 1892:593). Apachean *beesh* means knife, but it also means metal or flint, that is the primary substance used to make the knife (Greenfeld 1973:100). It is cognate with Northern Athapaskan words, such as Carrier *pîs,* referring to a fine-grained augite-porphyrite preferred for flintknapping, or Dena'ina *vashla, chavash* "woman's knife" (Golla 1998:2; Morice 1894:53). It is also cognate with Dena'ina *delvashi,* "lightning" (Kari 2007:149-150). Use of grooved arrow shafts, symbolic of lightning, is found in a continuum of cultures beginning with the Sekani Athapaskans in the western Subarctic, extending through the Great Plains and ending with the eastern Apaches in the Southwest (Mason 1907:98; Morice 1894:55-56).

Eursian Parallels for *Nbi'bibish,* 'the Lightning's Knife'

Extreme fear of destructive spiritual power of lightning (paralleled among the Apacheans) is found throughout the Tibetan-Mongolian religious world system, and is

attributable to the very real danger lightning poses to nomadic tent villages in wide-open spaces of the Altai-Sayan uplands and Tibetan Plateau (likewise among the mountain- and plains-dwelling Apacheans). This would be unremarkable, but the complex of symbolic associations with lightning in the shamanic cosmos are not always attributable to similar environmental conditions. Unlike the general shamanistic concern with the extrasomatic power of dangerous animals like bears, North Eurasian-North American practices and beliefs related to lightning and the spontaneous generation of bifacial tools is a striking parallelism at the level of minor detail, and worthy of consideration.

Lightning-struck tree-wood is used commonly by Siberian shamans for divination, purification, and healing of psychic diseases; such is reported in northeast-central Siberia among the Evenki of Sakha, in the northeast among the Turkic Yakut, and the Turkic Tuvans of south-central Siberia (Bulatova 1997:240; Czaplicka 1914:195; Stevens 2004:198). Altaian peoples will not eat the meat of an animal killed by lightning, and have special funerary protocols for people killed by lightning minimize contact with the deceased (Czaplicka 1914:162). Tibetan folk religion (in southern Siberia, Mongolia, Tibet and Nepal) includes the concept of the *thog lcags,* (pronounced togchag) “sky iron”*,* and closely related *thog rdo*, “thunderbolt stone” (Nepalese *vajra dunga*), equivalent to the White Mountain Apache *nbi'bibish.* Tibetan *thog,* “sky, roof, high, thunderbolt, lightning”, is equivalent to Apache *nbi*, and *lcags* “metal, flint”, is equivalent to Apache *bibish*; in compounds *lcags* can also mean lightning or thunderbolt (Jäschke 1881:148, 237, 286). Like traditional Apaches, traditional Tibetans believe that prehistoric stone blades (or meteoric metal and ancient bronze blades), adzes and arrowheads are protective amulets spontaneously deposited by lightning into trees and

soils. “Tibetans believe that at certain times when lightning strikes the ground it generates a spark which reacts with wet earth to produce thogchags” (Bellezza 1998:44). An archaeologist reported acquiring a Neolithic hand axe from a Tibetan peasant in Darjeeling, India, “the finder having seen a tree struck by lightning went to look for the thunderbolt and found it . . . in the ground amongst its roots” (Walsh 1904:21). The historical context for *thog lcags* and *thog rdo* traditions is further illustrated by John Bellezza:

> A belief prevalent among the nomads of northern Tibet is that thogchags can prevent a person from being struck by lightning, a palpable danger in the wide open spaces of this part of the country. . . . The earliest historical links seem to be with Bronze Age Sino-Tibetan cultures and the Central Asian Iron Age Saka-Scythians . . . arrows and other metallic objects [found] at graves and megaliths in northern Tibet. . . . Tibetan Neolithic fetishes . . . are credited with having been self-formed and have talismanic value. For example, the direct precursor of dart-shaped thogchags are probably dart-shaped Neolithic stone amulets . . . Neolithic arrowheads, spearheads, rings and even Paleolithic choppers . . . worn or enshrined for their purported supernatural properties (Bellezza 1998:44-47).

Altaic (Turkic-Mongolian) mythology suggests that the first sword was forged from indestructible meteoric “sky iron” by the culture hero Timur, whose name came to mean “iron”. The origination of this myth among Yeniseian-Xiongnu (Huns) is likely, as the sparse Xiongnu literary sources include the earliest references to the Altaic supreme deity *Tengri,* “sky”, which appears to be a Yeniseian etymon; the Yeniseian rootword **tɨŋgVr,* “high”, with the Altaic possessive suffix *–i* (Vovin 2003:389, 393). The metallurgical Saka-Scythian cultures of Central Asia contributed much to the mythology of the Altai-Sayan region and Northern Eurasia as a whole. Swords made from meteoric iron were called “thunderbolt swords” or “lightning blades”, and were believed to bestow divine power upon their wielder; this folk belief persisted in Central Asia from Buddhist times well into the Islamic period (Rosedale 1891:13).

Sequences of cognate mythological motifs involving sword-wielding culture-heroes are cataloged in North Eurasian cultures as far apart as Japan and the British Isles; these remarkable borrowings may suggest a common origin of the tales among the blacksmithing cultures of the Russian steppes (Littleton 1983, 1995). Likewise, the folk belief in the power of amulets or talismans made from archaeological arrowheads, axes, and knives, alleged to have been produced spontaneously by lightning and therefore protective against the same, is found in Eurasian cultures as far apart as Ireland, England, Tibet, China and Japan. All of these cultures have equivalent terms to Apache *nbi'bibish* or English *thunderbolt,* referred to a Stone Age arrowhead or adze worn as a talisman to protect from lightning (Ettlinger 1939; Reischauer 1940; Skeat 1912). This is strongly suggestive of a common origin for this practice in Eurasia, either prior to dispersion of East and West Eurasians circa 20,000 years ago or alternatively during the Metal Age less than 4000 years ago, among the highly mobile cultures of the Eurasian heartland, like the Scythians. The term “Metal Age” is often used by Central Asian archaeologists, because the distinction between Bronze Age and Iron Age in the region is imprecise (Bellezza 1998:46).

Metal Age origins seem plausible, as Stone Age peoples would be unlikely to posit supernatural origins for the utilitarian tools they made themselves—the mythologized context for stone tools appears commonly among peoples for whom the actual production of such tools has become virtually obsolete and therefore mysterious. The Athapaskan case would seem to be an exception to this rule. But further inspection shows that the demonstrably Athapaskan period in western Subarctic prehistory (mid-Common Era) is characterized by rapid replacement of atlatl technology by archery

technology, increasing reliance on bone, ivory and copper tools, and obsolescence of stone dart points (Clark 1991:102-103). Late proto-Athapaskan cultures are closely identified with the spread of the copper industry in the north (Clark 2001:175). Athapaskans are notoriously poor flintknappers whose stone projectile points are characteristically unrefined; finer and more distinctive specimens of lithic technology found in Northern and Southern Athapaskan contexts are often presupposed to have been scavenged from non-Athapaskan sources (Ferg and Kessel 1987:50-52; Morice 1894:54). For Apaches, it is just these finer specimens of mysterious prehistoric lithic workmanship that are regarded as spontaneously generated by lightning. This is analogous to the Eurasian Metal Age parallels. Oral traditions of Athapaskan copper use suggest the Athapaskan language expansion involved the spread of copper-working technology (Moodie et al. 1992).

For the Northwest Coast peoples lacking direct access to native metal sources, the situation was the reverse, because “the farther from the supply of copper . . . the more mysterious the origin, as is evident from the myths” (Emmons and De Laguna 1991:180). Athapaskan-made native copper arrowheads were kept as charms by Tlingit chiefs, later replaced by smelted sheet copper shield-amulets when European metals glutted the market (Keithahn 1964:77-78). Tlingit mythologized the origin of copper and were originally dependent on neighboring Athapaskan-Eyak middlemen to supply the metal; to the extent that heat-treatment was employed by Tlingit copper workers, it did not include the advanced tempering process of Athapaskan or Eyak coppersmiths, and heat treatment of any sort was limited to groups like Yakutat who

invaded Athapaskan-Eyak territory in the north of Tlingit range, assimilating local people and thus gaining knowledge of copperworking (Emmons and De Laguna 1991:179).

A Siberian Origin for Athapaskan Copper Metallurgy?

The skill of interior Athapaskan coppersmiths is significantly greater than that of Northwest Coastal peoples and Eskimos, contrary to stereotypes. Frederica de Laguna (1947:182) first noted the striking similarity between Athapaskan-Eyak spiral-hilted native copper daggers and the spiral-hilted bronze daggers of the Ordos region of Inner Mongolia and North China; she postulated that some historical relationship between the cultures involved was quite likely. Larger, somewhat cruder copies of these Athapaskan blades were made by coastal Tlingit using only cold hammering (in contrast to Athapaskan hot forging). The higher quality of Athapaskan-made metal daggers was necessitated by their key role in diversified subsistence strategies. Tlingit daggers, by contrast, were "luxury items that evolved as part of the affluence of Northwest Coast cultures" and "poorly adapted to any purpose more worthwhile than fighting" (Witthoft and Eyman 1969:22). Regarding Athapaskan metalwork, Witthoft and Eyman continue:

> Dene daggers in copper and steel, show both heat treatment and stress hardening as methods for controlling strength and edge-hardness of tools. Dene copper arrowtips, awls, and other tools show an equally expert technology. . . . [Dene] have been called one of the most primitive Indian groups in the Americas. Their use of metals was nevertheless the most sophisticated that we have seen in North America. . . . [T]he double-spiral motif of the Dene . . . has no exact counterpart in North American art except in Tlingit. It has many parallels in the art of north China and Siberia. . . . Dene . . . , considered peoples with simplistic technologies and a slight cultural heritage, appear in a new light as the carriers of a peculiar metal-age technology. . . . A single copper knife in any Dene collection raises problems inconsistent with the stereotyped phrases of the literature (Witthoft and Eyman 1969:21-23).

Figure 3-4 shows an example of a mid-nineteenth-century Tahltan (or Gwich'in) Athapaskan dagger I examined during my fieldwork (a forged steel copy of a copper

prototype), in comparison to a Krasnoyarsk-Tagar Siberian forged iron dagger from the Upper Yenisei river region, mid-first millennium BCE, like the contemporaneous bronze daggers from the same region. Tagar territory was home to Southern Yeniseian speakers in modern times, and R.V. Nikolaev argues that the Krasnoyarsk segment of the Tagar culture represents a northward incursion of Yenisean speakers into the Yenisei valley from the Sayan region during the first millennium BCE (Nikolaev 1989:70-72; Vajda 2001:207). If this view is correct, then the two pictured weapons come from linguistically affiliated peoples. The double-spiraled pommel of both weapons is visible (taking the form of mirrored rams' heads on the Siberian dagger), but the comparable axial ridge on the American blade is obscured by the dark patina. The two pommels and two blades are of nearly identical widths (about two inches and one inch respectively), but this American dagger is unusually short at seven inches compared to the Siberian weapon's twelve inches; Athapaskan native copper daggers as long as sixteen inches were examined by Witthoft and Eyman (1969:21). Copper daggers are highly uniform with a broad distribution in pre-Columbian northwest Canada and Alaska.

Figure 3-5 shows an assortment of Eurasian and Athapaskan forged metal arrowheads, diamond-shaped and hexagonal, featuring solid tangs for hafting or tubular projecting ones for insertion of the arrow shaft. Although less striking than the spiraled daggers, these objects show an equal mastery of heat-treatment and edge hardening techniques (Franklin et al. 1981). No heat treatment of stone tools is known in the Western Subarctic, which would be an expected antecedent if Athapaskan metallurgical skill with native copper was developed locally. Its absence is suggestive of a Siberian source for copper annealing technology (Clark 1991:116).

Molecular Genetics and the Dene-Yeniseian Family

The remainder of Chapter 3 is devoted to exploring the impact of the Dene-Yeniseian language family upon contemporary molecular anthropology. The burgeoning field of DNA-based population genetics is ideally positioned to address questions raised by the new linguistic consensus for Dene-Yeniseian geneaological ties. But the 'state of the discipline' is rather unreceptive to long-distance language relations, because most experts favor only one major migration from Asia to North America, a scenario incompatible with the notion that Na-Dene languages came as a part of subsequent migration(s). The following discussion will suggest alternative interpretations of the large body of molecular genetic data, which would be more compatible with the hypothesis of Dene-Yeniseian geneaological relatedness.

The last 20 years have been the formative period of molecular anthropology, and the growth of the field as a whole has been spurred by the steady increase in the efficiency, speed, volume and sophistication of DNA analysis. Earlier generations of archaeologists, linguists and physical anthropologists all more or less agreed that North America had been colonized by several different Eurasian founding populations at several different times. Today it is rare to find a molecular anthropologist who favors more than two distinct migration events, and a majority of researchers are enamored with the single-origin hypothesis, which postulates just one founding group ancestral to all Native Americans, lumping Eskimos and Na-Dene into the same Beringian cohort as the rest of indigenous Americans (Bonatto and Salzano 1997; Fagundes et al. 2008; Goebel et al. 2008; Kolman et al. 1996; Merriwether et al. 1995; Mulligan et al. 2004; Rubicz et al. 2002; Stone and Stoneking 1998; Tamm et al. 2007; Tarazona-Santos and Santos 2002; Zegura et al. 2004).

The main problem with the single origin hypothesis is that it is primarily based on surveys of uniparentally inherited DNA. Far more often this has been maternally inherited mitochondrial DNA (mtDNA), but more recently, the non-recombinant portion of the Y-chromosome (NRY) has achieved prominence as well. Uniparental mtDNA and NRY data do have the advantage of potentially revealing sex-specific migration history which is complementary to ethnology's emphasis on marriage customs and social organization based on geographic marital locality (Mooder et al. 2005; Wilkins 2006). But the drawback of uniparental data is that they are limited in their capacity to reveal complex demographic histories by a smaller effective sample size than autosomal DNA (Battilana et al. 2007:64-65), and are also subject to more pronounced loss of diversity due to genetic drift. And because just mtDNA has been most frequently used, it has potentially disregarded male-skewed founder effects relevant to Athapaskan migrations (Gordon 2012; Ives 2010; Wilson 2008). Based on autosomal non-coding regions with low to moderate recombination rates, contemporary Native Americans appear to be a representative subset of Eurasian genetic diversity (Battilana et al. 2007). Native American and Eurasian populations are profoundly similar, and it is difficult to sort out the significance of this similarity in terms of demographic history.

Because all known genetic diversity of both Eurasia and the Americas derives from the same Out-of-Africa population, a rough maximum time-depth for the peopling of the Americas may be inferred, but it is ultimately impossible to determine when the latest pre-Columbian migrations occurred, because genetic diversity within and between Old World and New World populations is nearly identical. Whether or not molecular divergence between related American lineages may predate their arrival on American

soil is impossible to determine, and thus "genetic evidence is expected to provide *maximum* age estimates for the peopling of the Americas" (Zegura et al. 2004:172; emphasis original).

Human Leukocyte Antigen Markers

In addition to the sex-specific markers, several autosomal/ biallelic markers are informative about Athapaskan/Na-Dene demographic history. HLA (human leukocyte antigen) evidence is one in area in particular where the single-origin hypothesis has not been endorsed by a majority of researchers. The HLA system is the major histocompatibility complex, a super-locus containing many immune-system genes, spread throughout the length of chromosome six. Substantial genetic support for Na-Dene ties to Asia has come from HLA studies. For example, HLA (DRB1 and DQB1) markers clearly distinguish between Eskimos, Athapaskans, and other American Indians, and these markers can be traced to different Old World source populations (Uinuk-Ool et al. 2003). Specifically, unique HLA molecular markers are shared by Athapaskans and Paleo-Asiatic populations of Siberia, and this has been cited as possible support of the Dene-Yeniseian language hypothesis.

> [T]he *HLA-DRB1* and *DQB1* frequencies of [Carrier and Sekani] are most similar not to those of any of the other groups of native Americans tested, but to those of the Nivkh on Sakhalin Island and in the Lower Amur region in southeastern Siberia. This grouping suggests that Nivkh and native Americans speaking Athabascan languages are derived from a common ancestral population, while other native American groups trace their origin to other ancestral populations (Uinuk-Ool et al. 2003:242).

Nivkh, like Ket, is commonly classified as a Paleo-Asiatic language. Nivkh have been residents of the Lower Amur River (Far Eastern Siberia) since the Neolithic, with an insular branch moving to Sakhalin Island in the last 1000-2000 years (Black 1973; Wixman 1984:145-146). Nivkh ethnic ties to Northwestern North America have been

previously suggested on the basis of linguistic typology (Sternberg 1904). Athapaskan ties to the Lower Amur region are also suggested by NRY work (Lell et al. 2002), while most other genetic studies connect Athapaskans (and Native Americans in general) to East Central Asia and southern Siberia. This need not be an 'either-or' proposition; a 'middle-way' scenario would envision the Lower Amur as a 'lay over' on the journey from Central Asia to Alaska, or as the eastern front of a vast South-Siberian population system, including all relevant populations (Wilson 2008:272-273). Recent high-resolution mitochondrial DNA work also indicates that the mid-lower Amur and the Sayan/Altai uplands of South Siberia represent two distinct segments of the ancestral founding gene pool for Native Americans, "at odds with the interpretation of limited founding mtDNA lineages populating the Americas as a single migration" (Volodko et al. 2008:1084).

Given that Yeniseian and Nivkh have no demonstrable linguistic relationship and are not in direct communion, significant admixture between migrant Central Asians and local Amur fishing peoples (among Na-Dene ancestors) could help explain these HLA data. Recent work has confirmed earlier studies connecting Athapaskans and Nivkh (and their Siberian neighbors) through high resolution HLA-DRB1 and DQB1 analysis, and furthermore has found evidence of admixture with transpacific colonizers; "different movements of people in either direction in different times are supported by the Athabaskan population admixture with Asian-Pacific population[s] and with Amerindians" (Arnaiz-Villena et al. 2010:103).

> [T]here is a clear genetic HLA relatedness between isolated populations close to Beringia: Eskimos, Udegeys, Nivkhs (North East coast of Siberia) and Koryaks and Chukchi . . . Athabaskan, Alaskan Eskimos (Yupik) and Tlingit. These results

> . . . suggest that admixture occurred between extreme North East Siberian groups and North American Na-Dene (including Tlingit) and Eskimo (Yupik) people (Arnaiz-Villena et al. 2010:105).

Arnaiz-Villena and colleagues favor a complex model of HLA admixture involving transpacific migrants merging with preexisting populations. They nonetheless believe all these movements took place more than 12,000 years ago (a long-chronology model), because the destruction caused by post-Columbian epidemics is known to have affected Eskimos, Athapaskans, and other American Indians more or less equally, suggesting that none of them had any particular immunity to Old World diseases provided by their HLA-based immune system. However, this view fails to recognize that the horror of Eurasian diseases was exacerbated by only a *slight* histo-compatibility disadvantage, and not one created by millennia of population isolation.

Virgin soil epidemics (like the bubonic plague) have depopulated major portions of Eurasia itself in the last 1500 years, despite the fact that the infected populations were already previously exposed to various other diseases through sustained long-term contact with the infectors. It is not the fact of recent long-distance migration which causes novel pandemics to flourish, but the *scale* of such migration, in conjunction with a variety of sociocultural-historical factors (like lack of quarantine, multifamily residence patterns etc.) and especially the sheer number and quantity of diseases appearing simultaneously, and the demographic imbalance between the infectors and the infected populations.

There is no evidence that Native American immune response was substantially different that any otherwise healthy low-density population would have been under the circumstances, and the Europeans died of their own diseases at high rates too (Crosby 1976). Western Europeans simply had an inexhaustible population reservoir to replace

their own numerous casualties, and a modest disease resistance provided by centuries of residence in urban 'cess pools'; "this pattern of less populous cultures succumbing to infectious disease . . . endemic in larger cities, . . . was a common theme throughout early Eurasian history" (Agger and Maschner 2009:321). Factoring in the more effective nursing and quarantine practices developed over centuries in toxic metropoleis, one realizes that Eurasian germ 'warfare' was as effective as it was for reasons well beyond the HLA system. Growing evidence for the moderate presence of several putatively Old World pandemic diseases in pre-Columbian American contexts bears this out, as Martin and Goodman point out:

> Osteologic data demonstrate that native groups were most definitely not living in a pristine, disease-free environment before contact. . . . Different populations were affected at different times and suffered varying rates of mortality. Diseases such as treponemiasis and tuberculosis were already present in the New World, along with diseases such as tularemia, giardia, rabies, amebic dysentery, hepatitis, herpes, pertussis, and poliomyelitis, although the prevalence of almost all of these was probably low in any given group (Martin and Goodman 2002:67-68).

Autosomal Recessive Diseases

Also relevant to Athapaskan culture history is the number of Athapaskan-specific autosomal genetic diseases stemming from a severe population bottleneck (or bottlenecks) during or near proto-Athapaskan timeframes. The frequency of otherwise rare autosomal recessive diseases among Athapaskan speakers is a strong indication of a relatively recent and rapid population expansion from an extremely small founding group. Some of these disorders are found exclusively in Northern and Southern Athapaskans; e.g. HOXA1 deficiency (Athapaskan Brainstem Dysgenesis), Navajo poikiloderma, and Athapaskan Severe Combined Immunodeficiency. Several other such diseases are exclusive to the Navajo. Most significant are those genetic diseases

exclusive to Athapaskans, their Yupik Eskimo neighbors, and Siberians. A single mutation underlying metachromatic leukodystrophy has been found among Navajo and Yupik Eskimos, and these particular Yupiks have intermarried extensively with Yukon drainage Athapaskan groups. Intermarried groups of Alaskan Yupik and Deg Hit'an Athapaskans, along with Southwestern Navajo and Siberian Yakuts all have a rare form of methemoglobinemia due to diaphorase deficiency, and a specific mutation has been identified in the Siberian population. "Until such time as the Navajo mutation is described, we will not know if this is a rare mutation shared by descent, but it seems likely" (Erickson 2009: 2604).

The Yakuts are Old Uyghur-Turkic (Altaic) speakers, commonly thought to have originated among the Iron Age horse breeders of the Altai/Sayan region and Southwest Siberia, before having been forced to migrate north and east along the Lena River in the thirteenth century in the wake of Mongolian expansion (Wixman 1984:219-220). Yeniseian languages were also forced northward along a major Siberian river valley (in this case, the Yenisei) during the same tumultuous period in history (Fortescue 1998:56)—both Yeniseians and Yakuts are allged to have moved from southwest Siberia to central and northern Siberia as a result of the Mongol aggression. Yakut historical range is several hundred miles from the nearest Ket bands to their west. Twentieth-century Yakut speakers occupied most of the contiguous territory between the Lower Tunguska River (a tributary of the Yenisei) and the Kolyma River in the northeast, where their neighbors are the 'americanoid' Chukchi (Figure 3-6).

Like the Athapaskans, Yakut were subject to severe genetic bottleneck(s) in the Common Era, and like the Southern Athapaskans, they are a very conservative

language family highly successful at assimilating other indigenous peoples and rapidly expanding their grographical range. Yakut ethnogenesis was very complex; their DNA appears heavily admixed between long-distance ECA and indigenous northern Siberian sources within the last 1000 years, and they also appear to have had a very small male and female founding group (Khitrinskaya et al. 2003; Pakendorf et al. 2002; Pakendorf et al. 2006; Pakendorf et al. 2003; Ricaut et al. 2006; Tarskaia et al. 2002; Zlojutro et al. 2009). Yakut DNA diversity includes all four major Native American mitochondrial founding lineages (A, B, C & D) and two Y-chromosome haplogroups (C3 and R1) common to Northern Athapaskans (Kharkov et al. 2008; Puzyrev et al. 2003). Common factors stemming from a similar genetic bottleneck in similar timeframes (and maybe ultimately stemming from common geographic origins near the Yeniseian urheimat) may provide the context for understanding the occurance of a methemoglobinemia due to diaphorase deficiency among Athapaskans and Yakuts.

Albumin Naskapi

Another autosomal marker characteristic of Athapaskan speakers is Albumin Naskapi (AL *Naskapi), an A→G transition in exon 9 of the gene (on chromosome 4) which is responsible for human plasma protein. The AL* Naskapi variant is widespread among Athapaskans, northern Algonkians, and in also found in Northern India and Turkey.

> The languages spoken by the several Algonquian groups in which AL*Naskapi has been found derive from a protolanguage estimated to be about twice as old as the proto- Athapaskan language . . . , and proto-Athapaskan was still spoken after the tribal groups speaking Algonquian languages were already geographically dispersed. This suggests that an Algonquian origin of AL*Naskapi is more plausible than an Athapaskan one. The dispersal of Athapaskan at a time after the hypothesized date when Algonquians abandoned the Columbia Plateau and the absence of AL*Naskapi in groups that speak languages related to Athapaskan, such as

> Tlingit, or purportedly related, as Haida, also support this hypothesis (Smith et al. 2000:565).

The Algonkian origin of this allele seems plausible. The Proto-Athapaskan founding population may have been extremely small, so that the assimilation of some comparably diminutive Algic band during proto-Athapaskan timeframes might have resulted in the near ubiquity of AL*Naskapi among Athapaskans due to rapid genetic drift within a few generations. There is a large Algic-Athapaskan interface in the Subarctic and Northern Plains, and Algic and Athapaskan communities are interdigitated and cooperative in California, difficult to distinguish archaeologically from one another, possibly indicative one recent multilingual migration wave from the Plateau region (Whistler 1979; see Figure 3-7). In short, the distribution of the AL*Naskapi allele is indeed very useful in looking at particular aspects of the Athapaskan expansion such as the movement of Apacheans out of the Plains (Ives and Rice 2006). However, until more comprehensive data are available (e.g., from the east and west coasts and from Alaska), then the relevence of AL*Naskapi to discussions of the ultimate origins of the Na-Dene is somewhat limited.

A final point about AL*Naskapi is worth making, related to the rare Old World occurrence of the polymorphism in Northern India and Turkey. Scott and O'Rourke (2010) assert that:

> As deriving Athapaskans and/or Algonquians from Eti Turks or North Indians seems unlikely, the possibility exists that the gene arose independently in the New World and the Old World. . . . If the gene arose through mutation in the New World, it would not help corroborate Ruhlen's (1998) view that Na-Dene and Yenisei groups were derived from a common Eurasian stem population. However finding *AL*Naskapi* in the Kets could support one Fortescue model that holds there was an east to west movement of Dene-Yeniseian-speaking populations in the Holocene (Scott and O'Rourke 2010:130).

Michael Fortescue (2010) hypothesizes that genetic data might be better explained by an east-to-west reversal the direction of migration (from Alaska to Western Siberia) as an explanation for the commonality of Dene-Yeniseian languages, which would then be classified as Paleo-American intruders into Asia. But it is not true that the hypothetical presence of AL*Naskapi among Yeniseian speakers must necessarily substantiate such a reflux (back migration) model, nor does AL*Naskapi having a well-documented presence among Turks and North Indians necessarily argue for the independent New World vs. Old World origins of the gene, as Scott and O'Rourke (2010) assert. I have already discussed the case of shared autosomal diseases among the Athapaskans and Turkic Yakut of Siberia, so another Turkic group having genes in common with North Americans is quite plausible. The common origin of Eti Turks and American Indians in ECA is a distinct possibility first discussed by the discoverers of this genetic marker among theTurks:

> We have suggested that the restricted distribution of the Naskapi allele makes it particularly valuable in determining population affinities between [American] Indian and Asian populations. . . . Modern Turkey was in antiquity part of the Eastern (Byzantine) Roman Empire, and historians of the period have provided extensive documentation of nearly continuous invasion of the area by nomadic peoples of Central and East Asian stock. . . . However, to distinguish between the possible origins of a Naskapi-like albumin in the Eti Turks requires collection of more data on the albumins of geographically intervening populations in Siberia and other parts of Central Asia (Franklin et al. 1980:5481-5482).

Corroboration comes from ancient DNA studies which show that the Xiongnu were genetically intermediate between Modern Turks, Mongols, and Native Americans. The co-occurance of mitochondrial DNA haplogroups A,B,C, D and M among the Xiongnu is indicative of their affinity to modern Mongolians and Native Americans (Kolman et al. 1996), and Xiongnu graves also yeild DNA shared with modernTurkey (Keyser-Tracqui

et al. 2003:256, 259). Ancient and modern DNA reveals that "the succession over time of different Turkic and Mongolian tribes in the current territory of Mongolia resulted in cultural rather than genetic exchanges" (Keyser-Tracqui et al. 2006:272). In other words, genetic continuity spans different ethno-linguistic imperial regimes. The Yeniseians of protohistory and ethnography may indeed have their ultimate southern origins in this turbulent milieu, as Asianists have long suspected. Therefore the presence of AL*Naskapi among Turks and/or Yeniseian speakers cannot be simply written off as evidence of independent origin of the same mutation, nor can it be used to infer back migration, with no other corroborating evidence. AL*Naskapi is just another in a long series of traits held in common between these specific populations.

Mitochondrial DNA

Contemporary Native American mtDNA haplogroups consist of four major lineages (A, B, C & D) present in both North and South America and one minor lineage (X) present in North America only. All five of these haplogroups are also present in Southwest Siberia / East Central Asia (ECA), but are discontinuous elsewhere in Eurasia (Mulligan et al. 2004). "The distribution of the four [main] founding lineage haplogroups in Native Americans from North, Central, and South America shows a north to south increase in the frequency of lineage B and a north to south decrease in the frequency of lineage A" (Merriwether et al. 1995:411).

The single-origin hypothesis originated from mitochondrial DNA studies, because "statistical and geographic scarcity of New World haplogroups in Asia makes it improbable that the same four haplotypes would be drawn from one geographic region" more than once (Kolman et al. 1996:1321). Genetic drift is then used to account for lower diversity in certain regions (e.g., the far north, where haplogroup A predominates).

But several other Eurasian mtDNA lineages and sublineages (e.g. M & D2a1) are also found in *ancient* far northern North America (Gilbert et al. 2008; Malhi et al. 2007; Stone and Stoneking 1998). The loss of additional rare lineages through genetic drift, genocide and disease is easily inferred. As the speed and scale of DNA sequencing technology increases, new insights abound. Just a few years ago, researchers claimed "our knowledge of mtDNA and the Y chromosome is pretty well saturated" (Mulligan et al. 2004:308). But since that time, the growth in the data has outpaced our ablitiy to interpret them; "the recognized maternal founding lineages of Native Americans are at least 15, indicating that the overall number of Beringian or Asian founder mitochondrial genomes will probably increase extensively" (Perego et al. 2010:1174). And rare North American lineages may have been misattributed to European admixture, especially where the lineages are common to both Europe and Central Asia (Wilson 2008:270).

Multiple reintroductions of the same Asian genes are possible; "there could have been multiple waves of migration from a single parent population in Asia/Siberia which repeatedly reintroduced the same lineages to the New World" (Merriwether et al. 1995:411). Recognition of the greater than expected diversity of American mtDNA founding lineages makes the possibility of multiple migrations from the same (or similar) source population(s) seem increasingly plausible. High resolution data provided by recent autosomal studies suggest an enduring connection between the continents in recent millennia. The contintent-wide similarity of Native Americans to Asians increases the closer one gets to Bering Strait (Wang et al. 2007:2049), a swath of the continent dominated by Athapaskans and Eskimos (the two major Native American ethnic groups with the strongest cultural and linguistic ties to Asia, and those with the most typically

‘Asiatic’ phenotypes). DNA and language agree with material culture as described by William Fitzhugh:

> Whether or not one agrees with the transoceanic mechanism . . . the stylistic parallels around the Pacific Rim are more abundant and more convincing than those around the Atlantic [and] the number of parallels increases and becomes more specific as one proceeds north from the mouth of the Columbia River to Bering Strait (Fitzhugh 1994:29).

Adhering to the now-dominant single origin paradigm, Wang and colleagues attempt to explain the parallel gradient of increasing molecular similarity with proximity to Asia as the result of the steady loss of the original genetic diversity as daughter populations moved south and east away from Bering Strait (Wang et al. 2007:2059). This explains private alleles (ubiquitous American polymorphisms). But the physical similarity of Native Americans to Asians is not particularly ancient, as one would expect following the single origin model. This model reverses the chronological priority of the derivation of Asian traits indicated by Late Holocene morphological discontinuities in the physical anthropology, not to mention the parallel archaeological evidence for the steady intensification of historical diffusion from Asia in the last 3000 years (Fitzhugh 1994). Wang and colleagues’ alternative hypothesis is more consistent with the cross-disciplinary data:

> Alternatively, similar patterns could result from gene flow across the Bering Strait in the last few thousand years, together with continual interactions between neighbors on both sides of the Bering Strait. . . . It is also possible to envision a series of prehistoric migrations, possibly from the same source population, with the more recent descendants gradually diffusing into pre-existing Native American populations (Wang et al. 2007:2059-2060).

This alternative is superior because it meshes with the cross-disciplinary evidence for Late Holocene Asian-American ties and it also accounts for the ubiquity of private American alleles (originating in the precursor populations). It largely agrees with

González-José and colleagues' attempt to introduce more flexibility into the single origin model by allowing for significant late Holocene gene flow into the existing populations; "recent circumarctic gene low would have enabled the dispersion of northeast Asian-derived characters and some particular genetic lineages from East Asia to America and vice versa" (González-José 2008:175). But this begs the question: is the term 'single origin' misapplied where such a tremendous influx of genes is evident? I propose the beginnings of a model where later genetic dispersals from Asia were absorbed by existing gene pools, maintaining the frequency of ubiquitous private alleles, while genetic drift favored the preexisting mtDNA lineages (mostly haplogroup A in the north), in disproportion to the influence of Asiatic ethnolinguistic cultures like Dene-Yenesiean.

An Earlier Study of Dene-Yeniseian Population Genetics

Wilson (2008) and Scott and O'Rourke (2010) have both written review articles addressing the genetic implications of the Dene-Yeniseian hypothesis. However, a 2002 paper by Rubicz and colleagues is the only original study to have collected original genetic data to purposefully test the veracity of this hypothesis as first proposed by Ruhlen (1998). Using primarily mtDNA molecular data (along with classical genetic immunoglobulin and blood group markers), they concluded:

> Contrary to Ruhlen's interpretation of the linguistic data, analysis of the genetic data shows that the Na-Dene cluster with other Native American populations, while the Kets genetically resemble the surrounding Siberian groups. . . . However, this study does show a significant correlation between genes and language when Na-Dene and Yeniseian are treated as distinct language families. These results suggest that the Na-Dene and Yeniseian populations are both genetically and linguistically unrelated (Rubicz et al. 2002:743, 755).

But Vajda (2010a, 2010b) has subsequently shown that a Dene-Yeniseian linguistic relationship is very likely, so the series of three caveats introduced by Rubicz

and colleagues (Rubicz et al. 2002:754) must be reconsidered, as John Ives has pointed out, it may be that:

> Yeniseian and Dene populations did not share a common genetic ancestry, but that there had been horizontal language transmission from one of these groups to the other; or, Yeniseian and Dene did have a common origin, but languages and genes evolved at different rates; or, Yeniseian and Dene had common linguistic and genetic origins, but recent genetic differentiation [via gene flow] had obscured the genetic relationship (Ives 2010:325).

I am inclined to disregard (2), evolutionary differential, which assumes much slower-than-expected language 'evolution' and/or faster-than-expected genetic evolution; these would require some form of Athapaskan exceptionalism. Alternatively, some combination of (1) horizontal language transmission through demic expansion and elite dominance and (3) gene flow from surrounding populations swamping the original genetic similarity, is not just possible, but quite probable under the known circumstances. These two processes (gene flow and horizontal language transmission) are closely linked phenomena along any cultural frontier, and were directly observed in ethnohistorical timeframes.

Signficant gene flow across linguistic boundaries is the rule rather than the exception (Hunley and Long 2005). Rubicz and colleagues' study is flawed because most of the non-Na-Dene Native American groups sampled (Blackfoot, Cree, Yupik, Ojibwa, and Papago) have had well-documented, direct, sustained interactions with Athapaskan speakers within historical timeframes, to say nothing of late prehistory. The only two groups who did not have direct relationships with Athapaskan speakers (St. Lawrence Yupik and subarctic Ojibwa) nonetheless had indirect or collateral relations with Athapaskans via their immediate neighbors of the same linguistic family (Cree in the case of the Ojibwa; Alaskan Yupik in the case of St. Lawrence). The Cree have a

vast frontier-interface with Chipewyan and Beaver Athapaskans, and historical alliances with both the Chipewyan and the Ojibwa. Alaskan Yupik have close ties to Dena'ina Athapaskans. Arizona Papago were nearly overrun by Apache after the seventeenth century, and the two groups formed numerous marriage alliances between periods of sporadic conflict. Finally, the Blackfoot virtually assimilated the Tsuut'ina. In short, all the non-Na-Dene North American natives selected for Rubicz and colleagues' study were peripheral to and engaged with Na-Dene speakers in a greater cultural sphere, and many have well-known kinship ties to specific Athapaskan groups. Thus their blood-affinity to Na-Dene speakers cannot be used to deny Athapaskan linguistic ties to Asia.

To assess the possibility of blood kinship between Na-Dene and Yeniseian, one must acknowledge that neither language group exists in a vacuum, but are both shaped by continuous historical affiliations with neighboring peoples. DNA evidence strongly indicates that Native American ancestors likely came originally from Central Asia, particularly the Altai region and southern Siberia (Derenko et al. 2001; Kolman et al. 1996; Starikovskaya et al. 2005; Zakharov et al. 2004; Zegura et al. 2004). We have not yet developed statistical methods for teasing out the stealthy signatures of later migrations from the same source populations. The molecular genetic data (in close agreement with the biometric data) suggest that the strong similarity between American and Central Asian gene pools has developed in tandem (Yao et al. 2004). This is impossible to explain with just one ancient migration, and some single origin proponents favor the notion that this is just a fortuitous coincidence.

> [O]ne must exercise caution before suggesting that Native Americans are descendants of Altai populations. The rich diversity of mtDNA lineages in

> the Altai suggests a pattern of gene flow with a spectrum of Eurasian populations. A genetic melting pot could easily contain all of the elements common in Native Americans and falsely give the impression of being the ancestor (Mulligan et al. 2004:302).

But this begs the question: how could significant recent Asian connections go largely undetected in the realm of mtDNA? Recent migrations are strongly implied by Dene-Yeniseian language links, skeletal morphology showing derived traits from Late Holocene Asia, and numerous cultural parallelisms "at the level of minor details which could be explained only by particular historical links between corresponding traditions" (Berezkin 2005:79). One possibility is that closely related mt-DNA lineages have been reintroduced from Asia on multiple occasions.

Mitochondrial Haplogroup A2a

Mitochondrial Haplogroup 'A' is ancient and widespread throughout the Americas. But Na-Dene-speakers have extremely high frequencies of a single subhaplogroup, classified as the A2a clade, indicating a founder effect prior to the Athapaskan expansion (Tamm et al. 2007; Malhi et al. 2008). This A2a clade is also shared by the Inuit and associated with the Neo-Eskimo expansion. Both ethnolinguistic expansions occurred during the Common Era, and both originated among neighboring populations in Alaska or Beringia. A2a is not found anywhere south of the historical Apachean range in Northern Mexico (Achilli et al. 2008; Gilbert et al. 2008; Perego et al. 2010). The age of modern A2a among Greenlandic Eskimos (using molecular divergence estimates) is between 1000 and 2000 years, "consistent with the hypothesis of a more recent origin and spread of the Neo-Eskimo Thule culture" (Gilbert et al. 2008:1788). A2a is also found in among Samoyedic and Evenki (Tungus) speakers in the Yenisei-Ob Sayan region of Southwest Siberia, precisely the region where Bronze-Age admixed

‘americanoid’ skeletons were found (Kozintsev et al. 1999), and where Yeniseian speakers resided as recently 200 years ago. Tamm and colleagues see this as a reflux migration from America back to Central Asia, in keeping with the single origin hypothesis:

> Surprisingly, we also found a Native American sub-type of haplogroup A2 among Evenks and Selkups in southern and western Siberia. . . . Previously, this HVS I motif is reported in one Yakut-speaking Evenk in northwestern Siberia. . . . A novel demographic scenario of relatively recent gene flow from Beringia to deep into western Siberia (Samoyedic-speaking Selkups) is the most likely explanation for the phylogeography of haplogroup A2a, which is nested within an otherwise exclusively Native American A2 phylogeny (Tamm et al. 2007:4).

Unlike A2a however, the *D9S1120* autosomal microsatellite 275 base pair allele is not found in any South or Central Siberian groups. This ubiquitous Native American private allele is found at moderately high frequencies (10-50%) in all Native American populations and also among the Chukchis and Koryaks on the Asian side of Bering Strait (Scott and O’Rourke 2010:129). This absence in the Eurasian heartland is truly remarkable if A2a is indeed the result of a long distance back migration from America as Tamm and colleagues allege. Since the autosomes have four times the effective population size of mtDNA, some A2a mtDNA carriers would be expected to leave *D9S1120* in the wake of their journey. If the original source of A2 lineage is Alaska (Volodko et al. 2008), then it seems most probable that this source came from a segment of the Alaskan population lacking the *D9S1120* 275bp allele.

A2a on the other hand is not universal in the Americas but is exclusive to the Neo-Eskimo and Na-Dene, two groups whose archaeological footprint is shallow and whose origin is proximal to Asia—less than 2500 years before present for both groups. A2a has only recently been dispersed continent-wide in North America through rapid

territorial expansion in late prehistory. Yenisei/Ob/Sayan A2a lineages could even be ancestral to late Holocene Bering Strait A2a lineages which have only spread as far as Greenland and Northern Mexico in the last millennium or so. At the very least, the widespread presence of the haplogroup reflects robust historical ties between Northeast Asia and Central Asia. Achilli et al. suggest that the A2a lineage is much younger than the other Native American 'A' mtDNA lineages, thus reflecting a much later expansion, "A2a (Siberians, Inuits and Na- Dené) . . . —is probably due to secondary expansions of haplogroup A2 from Beringia long after the end of the LGM" (Achilli et al. 2008:6). Scott and O'Rourke discuss the the existence of A2a in Southwest Siberia:

> While the Selkups are not Kets and they speak a different language (Uralic), the Kets and Selkups are closely aligned in many dendrograms, perhaps reflecting the role of geographic propinquity on historical patterns of gene flow. Another possibility is that this marker [A2a] was reintroduced from the East during the Holocene as proposed . . . by Michael Fortescue [2010]. . . . Unfortunately, at this time, there are very few 'genes across Beringia that support this scenario (Scott and O'Rourke 2010:129, 133).

Scott and O'Rourke (2010:129) refer to A2a as being common among "American Indians" in general, but neglect to mention that A2a is considered a specifically Athapaskan and Eskimo founding lineage, thus limited to portions of North America. "Geographic propinquity" is crucial, but the likelihood of horizontal language change or ancient bilingualism on the Uralic-Yeniseian frontier is another issue The Selkups not only neighbor Kets, but were culturally influenced by Kets too (Wixman 1984:175).

Male Mediated Migration

Long-term Asian gene flow and multiple migrations from Asia appear possible, but they are well-camouflaged by similar background genetic diversity; thus they are difficult to measure (Hey 2005:970-971). Further, historical scenarios can be constructed to

account for recent migrations that would have preserved the general distribution of ubiquitous, ancient mtDNA founding lineages and private autosomal alleles. Ives notes:

> Just as Moore (1994) predicted, we have entered an era in which "grand syntheses" of biological anthropological, linguistic and archaeological data have returned to prominence. . . . [A]pparent discrepancies between different forms of evidence may spur us to pronounce too quickly that one proposition or another is simply not possible (Ives 2010:331-332).

Recent work raises the issue of whether the Na-Dene founding population was sexually asymmetrical and male-skewed, in which case their mitochondrial DNA is *expected* to be indigenous to the Americas even as their Y-chromosomes may have come from historical Asia (Wilson 2008; Ives 2010). Bryan C. Gordon's (2012) synthesis of ethnology and genetics suggests that the Southern Athapaskan migration was initiated by mostly males who were disenfranchised caribou hunters from polygamous communities practicing female infanticide. This may help to explain why Apacheans in a very short time came to possess a plethora of local southwestern mitochondrial DNA lineages, while speaking a language of purely Canadian derivation (Romero 1998).

John Ives is particularly insightful in using Apachean male-mediated migration as an analog for the entrance of Dene-Yeniseian speakers to Alaska; the nature of the Apachean migration might be fundamentally similar to that of earlier Dene-Yeniseians. He notes that for the Apacheans, "[t]his small founding population experienced successful growth . . . through extensive incorporation of neighboring peoples, particularly women" (Ives 2010:330). He presciently relates this fact to the arrival of Dene-Yeniseians in Alaska: "Should members of linguistically and genetically unrelated communities regularly be incorporated into a conservative speech community, the linguistic identity would tend to survive, but the genetic signature would be steadily altered" (Ives 2010:331).

For the Apacheans, the male bias of the founding population(s) may have been very high, even as much as two to one, that is if the ~50% ratio of foreign mtDNA lineages among contemporary Navajo proportionally reflects the sex-bias in the founding population (Lorenz and Smith 1996). Closer to 100% of Northern Athapaskan maternal lineages are shared with Eskimos, suggesting that the male-bias of their founding population could have been even higher. If female founders were few enough in number, then their lineages could have been lost through genetic drift, as is the rule in the far north. Mitochondrial DNA diversity in the region is very low (haplogroup A is near fixation). Recently, two extinct mitochondrial haplotypes (M & D2a1) were discovered in Canadian human remains (Gilbert et al. 2008; Malhi et al. 2007). This suggests that the northern ecosystems could act as a 'filter' over time, with genetic drift preventing newer, rare Asian-derived mtDNA types from gaining a foothold, just as local isolates still fail to survive in the Subarctic (Meiklejohn 1977:110).

Y-Chromosomes

Y-chromosome data also reveal relatively few Native American founding lineages, forming a subset of Eurasian genetic diversity. In a survey by Stephen Zegura and colleagues, "three major haplogroups, denoted as C, Q, and R, accounted for nearly 96% of Native American Y chromosomes" (Zegura et al. 2004:164). These authors favor the single-origin hypothesis, and suggest that two of these lineages (C & Q) are paleo-American founding lineages more than 10,000 years old, and the other one (R) is a product of post-Columbian European admixture. Other scholarship alternatively suggests that only the Q sub-branch 'M3' is the paleo-American lineage, and that the main branch Q-M242, C and R were each introduced (or independently reintroduced) by Na-Dene speaking immigrants in a scenario consistent with the Dene-Yeniseian

hypothesis (Bortoloni et al. 2003; Lell et al. 2002). Each of the three paternal lineages (Q, C, and R) will be critically addressed below.

Haplogroup Q

A subclade of haplogroup Q (denoted Q1a3a1 and/or Q-M3, formerly Q3) is an ancient lineage indigenous to the Americas, whose common ancestor clade Q*-M242 (the defining mutation for the Q haplogroup) is found at moderate frequency among the Kets and Altai in Central Asia (Zegura et al. 2004). The two Q-branches very likely diverged between 10,000 and 15,000 years ago. The ubiquity and antiquity of Q-M3 in America makes it unlikely to have been associated with a recent expansion of Dene-Yeniseian speakers. Northern Athapaskan speakers have all Q variants at a frequency of between 20-50% (Malhi et al. 2008), which would seem like a high frequency for most populations. But it is exceedingly low for Native Americans where the typical frequency of haplogroup Q (Q-M3 + Q*-M242) is substantially more than 50%—the Subarctic is the American culture area with the *lowest* frequency of Q, reflecting the expansion of Athapaskan speakers from a small nucleus which included a significant number of non-Q lineages. The proto-Na-Dene were a very small founding population, confirmed by a large number of bottleneck-derived autosomal genetic disorders (Erickson 2009). Furthermore, the pan-Native American 'derived' Q-M3 is *rare* among Northern Athapaskans—the 'underived' Q*-M242 is common among them. The typical Athapaskan version of Q (Q*-M242) is more like those surviving in Central Asia among the Kets and their neighbors, than it is like any of the Q-M3 daughter lineages which can accurately be classified as paleo-American. The low-to-moderate frequency of 'private' American Indian Q-M3 among Northern Athapaskans can be explained as the signature of admixture with non-Athapaskans in the last millennium or more. "Haplogroup Q-

M242* . . . is the second most prevalent in the Chipewayan, where it was observed at a frequency of 25%. . . . Q-M242* was also detected at a low frequency (4%) in Mongolia" (Bortolini et al. 2003:528).

The *underived* form of Q (i.e. Q-M242*) is plausibly a signature of a Late Holocene expansion from the same source population, still found in Central Asia, and iclosely associated with the Na-Dene. Karafet and colleagues found "[t]he vast majority of haplogroup *Q* chromosomes (79.5%) occurred in only two Siberian populations, the Kets and the Selkups, with frequencies of 93.8% and 66.4%, respectively" (Karafet et al. 2002:772). The Chipewyan Q-M242* variant is molecularly closer to Mongolian Q-M242* than either Chipewyan or Mongolian is to common Native American Q-M3 *or* South American Q-M242* variants (Bortolini et al. 2003:535), which favors the view that the Chipewyan and Mongolian lineages have a more recent common ancestor than the other groups. Na-Dene Q-M242* may have been incorrectly pooled with Q-M3. Not all 'Q' lineages are necessarily paleo-American in origin; some have very likely been reintroduced by subsequent Central Asian immigrants.

Haplogroup C

The highest frequency of the common Native American Y-DNA haplogroup C3b-P39 is found among Na-Dene language speakers and their nearest neighbors (Malhi et al. 2008; Wells 2006; Zhong et al. 2010). The contiguous zone in which haplogroup C3b is found corresponds almost perfectly to the geographical limits of the Athapaskan expansion, enveloping all three discrete blocs of the language phylum, with little extraneous territory (Figure 3-8). This chromosome is relatively rare elsewhere in the continent and is also very similar to (presumably) ancestral C3*-M217 variants found in Siberia and East Central Asia. This has prompted some to suggest this chromosome

demonstrates the Na-Dene languages arrived as part of a separate major migration from Asia, distinct from other American Indians and Eskimos (Bortolini et al. 2003; Lell et al. 2002).

Zegura and colleagues' (2004) contrary assertion that haplogroup C is ancient and widespread among Native Americans is based the observation that the haplogroup has been found in all three of Greenberg's (1987) putative Native American linguistic phyla (Na-Dene, 'Amerind', and Eskimo-Aleut). The vastly different frequencies of 'C' among different Native American families are attributed to genetic drift in a small polymorphic founding population. This logic is suspect because the very existence of Greenberg's 'Amerind' phylum is rejected by a substantial majority of Americanist linguists (Bolnick et al. 2004). Admixture pathways of C3-lineages from Na-Dene source populations into non-Na-Dene groups during the Common Era are generally straightforward and easy to recognize. The recipient populations are addressed one at a time.

Haplogroup-C among Greenlandic Eskimos

Two contemporary east Greenlandic Ittoqqortoormiit (Neo-Eskimo) haplogroup C males have been identified (Bosch et al. 2003). The possible subhaplogroups of these Inuit 'C' Y-chromosomes were never determined. Every well-documented occurrence of haplogroup C in North America is C3-M217 subgroup C3b, defined by the P39 mutation (Zhong et al. 2010). It is not certain which specific branch of the C-clade would contain these unresolved Greenlandic examples. Nonetheless, Zegura and colleagues (Zegura et al. 2004) use these two isolated individuals to infer the presence of haplogroup C in a proto-Eskimo-Aleut population, subjected to extreme loss of diversity through genetic drift. This view is necessary to maintain a single-origin for all Native Americans, despite the rather strict geographic segregation of C3b-P39 to Na-Dene speakers and their

immediate neighbors. The problem with this hypothesis is that the Greenlandic Eskimos resided in close proximity to Na-Dene speakers in the not too distant past.

The well documented expansion of Thule Inuit out of the Bering Strait region took place entirely during the early-to-mid Common Era (Gulløv and McGhee 2006). These particular Inuit C-lineages may have direct ancestors in western Alaska or Bering Strait in just the last 1000-2000 years, just prior to the Thule Expansion. Several authors note that Eskimos and Athapaskans have enough biologically in common that they could be considered one population (Schurr 2004; Szathmary and Ossenberg 1978). Yet the dissimilarity in C3 Y-DNA frequencies between Eskimos and Athapaskans (very high in Na-Dene but very low in Inuit) indicates that Athapaskans may have received more gene flow from their Alaskan Neo-Eskimo contemporaries than the reverse, and thus the two families' origins may be technically distinct, despite being inextricably interwoven and complicated by prehistoric intimacy in Alaska. Sexual asymmetry among the Na-Dene founder population in Alaska is one possible explanation for this. The current distribution of mtDNA haplogroup A2a in Greenland is indicative of an Alaskan origin in close proximity to Na-Dene speakers within the last 800-1000 years (Saillard et al. 2000). The recent Alaskan origin of Greenlandic 'C' Y-DNA is also probable given classical biometric studies showing Greenlandic Eskimos physically resemble western Eskimos and Athapaskans more than any of these three groups resembles the eastern Canadian Eskimos (Shapiro 1931). Origins of the rare Ittoqqortoormiit haplogroup C Y-chromosomes are most likely to be found along the late prehistoric Eskimo-Athapaskan continuum, somewhere between western Alaska and northwest Canada.

Haplogroup C3 among the Cheyenne, Arapaho, Sioux and Ojibwa

A distribution of haplogroup C3 is present in a swathe of the Northern Plains and Upper Midwest southward to Oklahoma (Bergen et al. 1999; Bolnick et al. 2006). This zone is contiguous with both major Athapaskan blocs, and it thus requires little more than gene-flow to explain the presence of haplogroup C3 there. There is a well documented history of Tsuut'ina (Sarsi) Northern Athapaskans and Plains Apache moving through the Plains corridor in the last few centuries (Gunnerson and Gunnerson 1971). Sioux are relatively recent arrivals in their current territory of the Dakotas, believed by a number of archaeologists and historians to have been a major Apachean stronghold in the eighteenth century (Grinnell 1920; Hyde 1959; Wilcox 1981). C3b-P39 is widespread among Na-Dene groups, at frequencies as high as 25% to 45% (Wells 2006; Malhi et al. 2008). Most Plains tribes possessing frequent C3b Y-chromosomes until recently occupied the former territory of the itinerant Athapaskans, also sharing numerous material cultural features with their Athapaskan neighbors (i.e the Apacheans and Tsuu'tina), e.g. hard soled moccasins, sinew-backed bows and bison hide shields, and domicile design, among many other things (Baldwin, 1997; Brasser 1979).

The Ojibwa, Cheyenne and Sioux effectively form a band of genetic continuity connecting the Northern and Southern Athapaskan blocs. It is likely that horizontal language transmission may have taken place here, as Apachean stragglers or remnant bands were assimilated by Sioux and Cheyenne after the eighteenth century. The nineteenth-century witnessed a coalescence of pan-tribal northern Plains society after an extended period of population decline (Taylor 1977). This situation favored gene flow and genetic drift, reducing overall diversity and altering gene frequencies. The Southern Cheyenne allotment census of 1892 demonstrates the Cheyenne did

assimilate some Apaches (Moore 1994:937). A very severe disease-induced genetic bottleneck impacted the Cheyenne in the late nineteenth-century (Bergen et al. 1999). This could easily have amplified the proportion of C3 lineages in the population through genetic drift. The Chiricahua Apache were relocated to Fort Sill, Oklahoma in 1894. Cheyenne, Arapaho, Kiowa, (local) Plains Apache and (non-local) Chiricahua Apache tribes have all been near neighbors or cohabitants of several reservations tightly clustered just east of Oklahoma City, likewise as urban Indians in Oklahoma City itself, which has the largest population of off-reservation Apaches anywhere. The assumption that the gene frequencies among any groups currently residing in Oklahoma are accurate reflections of their pre-contact situation is highly problematic. Cheyennes, Sioux, Plains Apache and Arapaho all had similar equestrian lifestyles in the nineteenth-century and extensive historical range southward from base camps in the Black Hills. The presence of haplogroup C3 in any groups residing in this zone can be most easily attributed to an ultimate Na-Dene source.

The virtual absence of C3 in the Great Basin is in perfect agreement with absence of the autosomal marker Albumin Naskapi (AL *Naskapi), a variant also common among the Athapaskans and their Algonquian neighbors of the Plains and Subarctic (Smith et al. 2000). This may be a signal that the Numic Expansion (the movement of Uto-Aztecan speakers into the Great Basin) involved later movements of populations originating from the south, who did not receive appreciable gene flow from Athapaskans. Alternatively, it could mean that the Athapaskan migrants avoided the Great Basin on their long trek south (Ives and Rice 2006).

The occurrence of C3b-P39 among westernmost Ojibwa (Bolnick et al. 2006) is also readily attributable to gene flow through the Algonquian bloc on the Plains-Subarctic boundary. The Ojibwa's residence in the middle Subarctic, where exogamy and endogamy co-occur by necessity (obliterating demic boundaries), is sufficient for them to have absorbed significant Na-Dene-derived genes from the west, via their Northern Plains Algonquian and Siouan neighbors (Meiklejohn 1977).

C3 in the Southeast?

Unlike the straightforward presence of haplogroup C in the north and west, the rare occurrences of C3 lineages among two different Southeastern peoples would pose more of an apparent problem for the Athapaskan/Na-Dene origin of this paternal lineage, except that both of these groups were relocated to northeastern Oklahoma circa 175 years ago, where they would have been in direct, sustained contact with Plains tribes including Apaches and closely associated peoples. Bolnick and colleagues found haplogroup C3 present in one Muscogee Creek individual and one Cherokee individual residing in Oklahoma (Bolnick et al. 2006). Bolnick and Smith (2003) include the detailed sample information for the later study. These are both classified as Southeastern-derived C3 lineages, presumably because the Creeks and Cherokee share an ancestral homeland in the Great Smoky Mountains and a historical legacy amongst the so-called Five Civilized Tribes in the early nineteenth-century southeast. However, both of these specific cases are readily explicable as the result of historical interactions with Plains residents after 1835-6, when the Trail of Tears brought most of the Muscogee Creek and Cherokee to reservations in northeastern Oklahoma. The indigenous Plains Apache of Oklahoma (largely assimilated by the powerful Kiowa)

would have spread their paternal lineages far and wide in Oklahoma territory for generations prior to the Cherokee arrival.

The relocation of captive Chiricahuas in the 1890s introduced more C3 lineages to Oklahoma, where the chromosome was already well established among numerous Plains peoples, and among urban Indians in Tulsa and Oklahoma City. The likelihood that the single Creek and single Cherokee male inherited their haplogroup C3 Y-chromosomes from any of a plethora of local sources in Oklahoma is overwhelming. There is virtually no chance this C3 lineage is original to Creek and Cherokee migrants.

The choice by Bolnick and colleagues to genetically test the *Oklahoma* Cherokee and Creek tribes (rather than the smaller units of the same tribes located in North Carolina and Alabama respectively) is perfectly understandable because the Oklahoma tribes are more likely to provide a larger sample of reputed 'full bloods,' whereas the communities still remaining in the Southeast are heavily admixed with non-natives. However, this strategy has the major drawback of being blind to the much subtler effects of admixture with other Native American groups in the pan-tribal melting pot that is the state of Oklahoma. Native groups have been relocated there from many hundreds of miles apart. During the nineteenth-century, peoples originally from the Southeast would have encountered other forcibly relocated first nations from as far west the Columbia Plateau, and all would have been placed in reasonable proximity to local natives (such as Plains Apache), and would have surely encountered one another in major urban centers like Tulsa (originally a Muscogee Creek settlement) during the era of the emergence of widespread Pan-Indian solidarity movements.

Bolnick and colleagues (Bolnick et al. 2004, 2006; Bolnick and Smith 2003) are to be applauded for their comprehensiveness and careful attention to ethnohistorical detail in their discussions of the demographic history of the Southeast. This aspect of their work makes them noteworthy among molecular anthropologists who are too often inattentive to the contribution humanistic research can make to their discipline. However, their detailed historical summary of the post-contact era through the relocation period is not matched by their rather cursory approach to the demographic realities of life in Oklahoma since 1835.

> [T]he geographic proximity of many reservations in Oklahoma may have increased gene flow among the southeastern populations. Historical events may have therefore contributed to the observed patterns of Y chromosome variation (e.g., closer paternal relationships among populations from the Southeast than among those from the Northeast). However, such events cannot explain the opposite pattern observed in the mtDNA data (Bolnick and Smith 2003), so they must have had less effect on eastern North American genetic variation than past patterns of postmarital residence (Bolnick et al. 2006:2171).

In the Southeast, kinship was reckoned matrilineally and postmarital residence was matrilocal. The effect of this marital pattern on rates of sexually asymmetrical admixture among Creek and Cherokee cannot be denied, but it is incorrect to imply that this effect was limited to the contact-traditional period before 1835; traditional customs likely prevailed in intertribal marriages in nineteenth-century Oklahoma, especially when multiple disparate tribes were known to have similar (or nearly identical) customary kinship and residence patterns.

Oklahoma Apaches have historically included several groups; local Plains Apaches, itinerant Jicarilla and Lipan Apaches, and forcibly relocated Chiricahua Apaches (residing in a concentration camp at Fort Sill between 1894 and 1913). Since circa 1835, formal marital arrangements between traditional Apaches and Southeastern

peoples are quite conceivable, as the predominance of matrilineal matrilocal clan systems and exogamous marriage customs among southeastern societies are quite comparable to traditional Apachean kinship systems (Lewis and Jordan 2008; Opler 1936). The nineteenth-century progeny of Apache men married to Creek or Cherokee women would result in individuals who were considered 'full blooded' Indians and full-fledged members of their maternal clans. In both southeastern and Apachean custom, the tendency would be to deemphasize the paternal cultural heritage of an individual in favor of the maternal heritage, and this could result in a stealthy form of intertribal male-biased admixture, even in the most culturally conservative of groups, making their distinct genetic origins much harder to determine through Y-chromosome analysis. In this regard, historical European and African American admixture observed amongst the remnant Creeks in Alabama and Cherokees in North Carolina is a more straightforward problem, and less likely to produce errors in interpretation. This whole issue is more of a problem for scientists than it is for natives, for whom concepts of genetic ancestry are far less important than social identification with a particular group (Bolnick et al. 2006).

C3*-M217 in South America

The greatest difficulty in addressing the New World history of Y-DNA haplogroup C3 is the presence of two C3*-M217 individuals among the Wayuu tribe of the La Guajira Peninsula, on the Atlantic Coast of Northern Columbia and Venezuela (Karafet et al. 1999); these cannot possibly be of Na-Dene origin. However, the Late Holocene saw the sudden appearance of derived Asiatic skeletal morphology in both continents (González-José et al. 2008). If Y-DNA haplogroup C3 is a signal of Late Holocene migration from Asia, what could explain its isolated presence in the northwestern quadrants of both continents? It is highly improbable that Apache genes ever

penetrated that far south of historical Apache raiding grounds in northern Mexico. Furthermore, the Wayuu C3*-M217 variant is underived with respect to the C3b-P39 variant common to Na-Dene and other North American natives. The Wayuu C3*-M217 is separated by a full 6 mutational steps from the (Na-Dene) C3b-P39 form, "reflecting its marked divergence from the predominant Native American C-haplogroup" (Zegura et al. 2004:169). However, C3b-P39 is rooted in the Altai/Selkup/Ket population system (includingYeniseian forebears of the Na-Dene), while the Wayuu variant of C3-M217 is rooted in the 'Other Asians' population system (Figure 3-9).

Only two mutational steps separate Wayuu C3-M217 from two different 'Other Asian' C3*-M217 lineages, whereas Na-Dene C3b-P39 variants are separated by only two mutational steps from a pool of M217 lineages including Yeniseian speakers (Zegura et al. 2004). Only *one* mutational step (in sixteen microsatellite markers) separates a particular Navajo C3 variant from an Amur Basin M217 variant in northeastern Siberia (Lell et al. 2002). This means it is conceivable that the two different versions of the M217 haplogroup were introduced as separate founding lineages, one of which is Dene-Yeniseian.

Haplogroup R1 and Post-Columbian Admixture

NRY Haplogroup R1-M173 is extremely common among Native Americans in both North and South America, likewise common among Eskimos and Athapaskans, but with highest frequency on the Northeast coast, Eastern Arctic and Subarctic. It is also extremely common in Western Europe. Lell and colleagues, noting its presence in the Amur Delta region along with the apparent ancestors to Na-Dene C3 lineages, have suggested that it was part of a more recent major migration that brought the Na-Dene (Lell et al. 2002). This assertion has been vociferously challenged because there is a

clear correlation between the frequency of R1 and the amount of European male-mediated admixture since 1492; the extreme northeastern concentration of R1-M173 (around the beachhead for transatlantic colonization) is strongly indicative that many of these chromosomes were post-Columbian introductions (Bosch et al. 2003; Malhi et al. 2008; Zegura et al. 2004). But simply assuming all R1 lineages are post-Columbian is not sufficient. In a follow-up article, Lell, Sukernik and Wallace defend a Siberian origin hypothesis for Na-Dene R1:

> However, this [admixture] argument would require that the proposed European male input into the Native American populations not only was extensive but also brought only a limited number of Y-chromosome haplotypes. . . . This possibility is contrary to the historical fact that European male admixture into Native American populations has been continuous over the past 500 years and that it has been derived from populations throughout western Europe. By contrast, the M45b [R1*] Y-chromosome microsatellite markers that we found in northern North Americans are either identical to or closely related to those that we found in eastern Siberia. Hence, we feel that it is much more likely that the M45b [R1*] Y chromosomes, which are common in northern Native Americans, came from the Siberian Pacific, where the remnants of their exact counterparts are currently located (Lell, Sukernik and Wallace 2002:1380-1381).

The lowest frequency of R1 is found among the Southern Athapaskans and particularly the Navajo, considered by numerous other measures to be among the *most* heterozygous and therefore admixed Athapaskan populations, whereas the highest frequency is found in the relatively unadmixed Northern Athapaskans, strongly suggesting that all Native American R1 lineages cannot be dismissed as resulting from Euro-American admixture (Figure 3-10).

The century of close interaction between Chipewyan and the Métis communities around Fort Chipewyan has resulted in a number of very old Chipewyan families with European surnames (McCormack 1988), and thus European admixture is doubtless at

play in the fact that more than 60% of Chipewyan y-chromosomes are R1. However the uniformly high frequency of R1 among Northern Athapaskans, and its consistent frequency in proportion with 'diagnositic' haplogroup C3 in Athapaskans in general, would cast doubt on the idea that all Athapaskan R1 chromosomes are European-derived; it is also not intuitively consistent with the high level of traditionalism and cultural vitality among many of the groups in question (Bortolini et al. 2003). And a question is implied by Lell and his colleagues quoted above, why must R1 in particular be so common, when many other European Y-lineages were introduced after 1492? Some of the Na-Dene R1 lineages may have a Siberian and/or ECA origin (Bortolini et al. 2003; Lell et al. 2002). If so, how might it be possible to determine which ones are pre-Columbian, and which are post-Columbian in origin?

The R1*-M173 parent clade is widespread throughout the whole of Eurasia (Karafet et al. 2001). Malhi and colleagues (Malhi et al. 2008) assume European admixture, but do not differentiate between various 'R' subclades among the Athapaskans they surveyed. Fully 76 of 79 Native American R chromosomes were (apparently) European-derived R1b (Zegura et al. 2004), although R1b also has a wide distribution in Eurasia. There was one Pima example of Haplogroup R-M124 and two Inuit Examples of R-M17 (Tatiana Karafet, personal communication 7 January 2011). While R-M17 could also be European, it is very common among Central Asians, and "R-M124 is restricted to the Indian subcontinent, Iran, and central Asia" (Cordaux et al. 2004:232). Some Native American R lineages are unlikely to be a result of European admixture. Only 8 of Zegura and colleagues' 79 R1 chromosomes were from Na-Dene groups (1 out of 12 Tanana and 7 of 174 Apachean), and the total sample of Northern

Athapaskan speakers (a group normally very high in R) was just 12 (Zegura et al. 2004). Furthermore, 28% (22/79) of all the R1 chromosomes in their sample came from just one group (Sioux) and 31% (25/79) came from Mesoamerica between Southern Mexico and Northern Colombia; thus the majority of R1 chromosomes surveyed came from an extremely limited geographic area. No one (to my knowledge) has provided any recent detailed scrutiny of sequence data for the high rate of R1 in (apparently) relatively unadmixed Northern Athapaskans.

A clear understanding of the proportion of various 'R' subclades in various native groups with known European contact histories would help to clarify the possible source populations for Native American R chromosomes, pre-Columbian or otherwise. For example, in Western Europe, the R1b subclade is far more common, with R1a infrequent Britain, and virtually absent in the Iberian Peninsula. Thus, the Iberian colonizers of Mesomerica have contributed virtually no R1a chromosomes to the mestizo and indigenous communities there, and the near-exclusive presence of R1b in Central and South America is consistent with the colonizers Hispanic/Iberian origins (Zegura et al. 2004). For Anglo-Saxon admixture in Northern North America (e.g., among the Sioux), R1a would also be necessarily very low compared to R1b. The relative frequency of R1a (compared to R1b) increases dramatically in Eastern Europe and Northern Europe, and the historical migrations of Scandinavians to Greenland and Russians to Siberia and Alaska would be expected to introduce R1a chromosomes in higher percentages to admixed populations (Zlojutro 2008; Bosch et al. 2003). Central European migrants (like Germans) would be expected have intermediate frequencies of both types (Underhill et al. 2010).

Among the peoples of the Altaian/Sayan region of Central Asia thought to be collateral relatives of American Indians, there is a diverse range of haplogroup R chromosomes (including ocassionally R1* and R1b3) but the frequency of the R1a subclade R1a1 is particularly high, often greater than half, i.e. higher even than in Russians or Norwegians (Kharkov et al. 2007). If these Altaian R1 frequencies were found to be similar in antiquity, the presence of Siberian-derived R1a1 or other R1 variants among Athapaskans and Inuit would be quite possible. Whereas Bosch and colleagues were swift to dismiss the presence of R1a and R1* among Inuit as a product of Scandinavian admixture (Bosch et al. 2003), this is not an ironclad assumption, noting the presence of both R1a and R1* among native Altaians. The dispersal patterns of R1a are not clearly understood, "as no marker has yet been described that would distinguish European R1a chromosomes from Asian" (Underhill et al. 2010:479). Furthermore, the proportion of the three predominant Y-chromosome haplogroups Q-242, R1 and C3 are roughly similar in Athapaskans and in Altaians. The Altaian frequencies of R1 are also widely presumed to be derived from admixture, albeit *millennia* ago rather than in recent centuries, as Kharkov and colleagues note:

> Haplogroup R1a1 prevailed in both . . . Southern and Northern Altaians. . . . This haplogroup is thought to be associated with the eastward expansion of early Indo-Europeans, and marks Caucasoid element in the gene pools of South Siberian populations. . . . [T]he second frequent haplogroup Q* represents paleo-Asiatic marker, probably associated with the Ket and Samoyedic contributions to the Altaic gene pool. . . . The presence of haplogroups C3xM77, C3c . . . reflects the contribution of Central Asian Mongoloid groups. These haplogroups, probably, mark the latest movements of Mongolian migrants from the territory of contemporary Tuva and Mongolia (Kharkov et al. 2007:551).

The fact that haplogroups Q, C and R frequently co-occur as the three major lineages in precisely the same allegedly 'paleo-Asiatic' Southwest Siberian populations

should give us pause. Karafet and colleagues found unspecified R lineages constituted 10% of their Siberian sample, but were significantly higher than this in the Yenesei and Altai regions, residence of possible relatives of the Athapaskans (Karafet et al. 2002).

> The estimated age of *R-SRY10831b* (roughly 4000 years) is well after early human dispersals into Siberia. It has been suggested that *R-SRY10831b* likely traces a population migration originating somewhere in southern Russia and the Ukraine. . . . The presence of *R-SRY10831b* in western Siberia probably chronicles known migrations originating in the Altai and Sayan Mountains. The low frequency of this haplogroup in several Central and East Siberian populations is most likely due to admixture with recent migrants of European descent (Karafet et al. 2002:784).

It does appear that Russian colonizers may have spread a number of R1 lineages in East Siberia and the Western Aleutians, and that Americans of Scandinavian descent may have helped spread *R* lineages among Alaska natives; "R has a very broad distribution, but exhibits extensive sharing with European lineages based on Y-STR haplotypes" (Zlojutro 2008:37; see also Zegura et al. 2004). However all R lineages exhibit extensive sharing with European lineages, even those from Bronze Age Central Asia and Siberia. The inability to distinguish between European-derived and Asian-derived R1a1 lineages is a persistent problem, considering that all these lineages share a common origin in the Bronze Age Russian steppes. No one has found a way to distinguish definitively between those R1 lineages introduced during the Russian colonial period, and those introduced centuries or millennia earlier under long-lived transcontinental equestrian nomadic confederacies like the Xiongnu/Huns and others (Underhill et al. 2010). Until a large bank of high-resolution Y-chromosome sequences are available for study, the demographic history of haplogroup R in the Americas will remain something of a mystery. R1a is extremely common among Uralic speakers, including Finno-Ugric and Samoyedic, both considered distant linguistic relatives of the

Eskimo-Aleuts by Fortescue (1998). R1a is also the second most common Y-DNA lineage (after Q*) among the Selkups, closely related (biologically, not linguistically) to the Kets (Tambets et al. 2004).

Several recent ancient DNA studies suggest that the presence of haplogroup R1a1 was well established in Central Asia and South Siberia well before the Common Era, even long before the tenure of the Xiongnu Empire. R1a was nearly ubiquitous in parts of South Siberia by the Middle Bronze Age at the latest. Ancient DNA has been examined from the Krasnoyarsk region of the middle Yenisei River, where Yeniseian languages were likely spoken from 2500 years ago until the eighteenth century (Nikolaev 1989). A recent study found that the R1a1 lineage was the predominant, universal patrilineage in this region for the entire span of the the period from 4000 years ago until circa 500 CE (Keyser et al. 2009). These authors further suggest that these Bronze and Iron Age Scytho-Siberians and Yeniseian-Tagar were responsible for the early peopling of the Tarim Basin and the rise of the Xiongnu Empire in Northwestern China, providing genetic and archaeological support for the Xiongnu-Yeniseian linguistic hypothesis of Vovin (2000, 2003) and Pulleyblank (1962). Another recent study (Li et al. 2010) verifies the genetic continuity between Siberia and the Tarim Basin, finding that the oldest human remains ever found in the Tarim Basin, from a 4000-year-old cemetery, revealed an admixed population of exclusively R1a1 patrilineages, in the company of diverse East and West Eurasian mtDNA lineages.

An older study (Keyser-Tracqui et al. 2003) shows that, in agreement with the diversity of modern DNA in Mongolia (Kolman et al. 1996), a 2000-year-old Xiongnu necropolis in Mongolia includes all four major American mtDNA haplogroups (A, B, C,

and D) plus haplogroup M. Haplogroup M was recently also found in ancient American DNA (Malhi et al. 2007). Others further note the surprising co-occurrence of Y-DNA haplogroups R1a1 and C3 within contemporaneous individuals in a 2000-year-old elite Xiongnu cemetery in Northeast Mongolia (Kim et al. 2010). This is near the Siberian provinces identified as the source for Athapaskan R1 lineages (Lell et al. 2002). Until a broad, high resolution survey of Asian and Athapaskan R1 lineages is able to prove recent Russian or American admixture, the Bronze Age Siberian source for prevalent Dene-Yeniseian R1 lineages remains a viable hypothesis.

Native North American R1 lineages reveal a great amount of post-Columbian European male-mediated admixture. However, given the incredibly vast geographic spread in association with Bronze Age pan-Eurasian empires, and the relatively youthful ~4000-year age of the R1* clade, there is presently no way of determining exactly what percentage of Native American R1 chromosomes may have been introduced at the time of the sudden Late Holocene appearance of derived Asiatic phenotypes in the Americas (González-José et al. 2008). Furthermore, even if the Scandinavian source of Greenlandic Inuit R1a and R1* is borne out (Bosch et al. 2003), there is no guarantee that all such admixture is post-Columbian. Scholars have largely neglected to consider whether or not the pre-Columbian Norse colonists admixed with Neo-Eskimos or Paleo-Eskimos (Agger and Maschner 2009; Sutherland 2009). Thus, multiple different sources for haplogroup R1 among Native Americans appear credible in the light of present data. Sorting them out is a daunting task, but the issue must not be avoided.

Summary

In summary, the three major North American Y-DNA haplogroups, like the five mtDNA haplogroups, each have complex, multilayered histories. Colin Renfrew (2010:136) writes that "[u]ntil there is consensus about the initial colonisation of the Americas and its genetic imprint, it may be difficult to achieve a more effective archaeogenetic narrative for the remainder of the pre-Columbian period." This is not simply a question of building a consensus surrounding the date of the earliest peopling of the continent, but a host of other questions about the number, timing, duration, direction and scale of movements between the Old World and New World. The failure to achieve synthesis between linguistics, ethnology and genetics owes to a failure to consider all possible variables. Mulligan et al. write:

> researchers looked for consistency with more complicated hypotheses before trying to reject simpler ones. . . . The flaw with this approach is that it places no practical limit on the number of migrations that can be accepted for a data set. Moreover, when the sources of the proposed migrations are highly speculative, there is a danger of reverting to an earlier day of anthropological explanation . . . Nevertheless, linguists continue to research and debate the issue . . . , but few geneticists have the expertise in linguistics to evaluate their debates (Mulligan et al. 2004:307).

This admitted lack of linguistic expertise has not prevented molecular genetic studies from playing a 'hard science' trump card over the less empirical subdisciplines for the last decade, even as molecular anthropology has barely emerged from its infancy. One is not a reasonable "practical limit on the number of migrations," where back and forth movements of natives on opposite sided of Bering Strait have been observed with some frequency since records were kept. The acceptance of Dene-Yeniseian language links by most linguists now appears to strongly favor at least two major migrations. As Galina Dzeniskevich notes with regard to the prevalence of Asian

material culture among Athapaskan speakers, “If the narrow strait between the continents did not obstruct the diffusion processes two or three centuries ago, then it could hardly have been insurmountable in the fifth to tenth centuries, and earlier” (Dzeniskevich 1994:59). While Scott and O’Rourke have produced a good summary of the genetic literature for genes across Beringia, they conclude on a pessimistic note regarding the ability to connect Na-Dene genetically to the Ket:

> While linguists have developed a solid case linking the North American language family Na-Dene with Yeniseian, we have not found comparable parallels in the biology of these ‘groups’. There are several lines of evidence that point to central Siberia as the ancestral homeland for some portion or even all of the Native American gene pool. However, there is no specific gene, haplogroup, or dental trait that provides a direct link between the Kets and any Na-Dene speaking population. . . . At this time, we can infer that the ancestral populations of Na-Dene are linked to central Siberian and east Asian groups but can make no claim about their specific genetic affiliation with Kets (Scott and O’Rourke 2010:133).

It may be true that the Ket, as the last surviving Yeniseians, are themselves imperfect biological corollaries for the once-large, multiethnic Siberian/ECA language family they represent. But linguistic families often behave as fleeting waves on the surface of a deep ocean of genetic continuituity. The histories revealed through the surface features of languages are different, but not better or worse, than those revealed through the deep sea of nucleo-‘tides.’ A paradigm shift resulting in a synthesis of the three datasets of genes, languages and material culture must recognize and embrace their imperfect harmony.

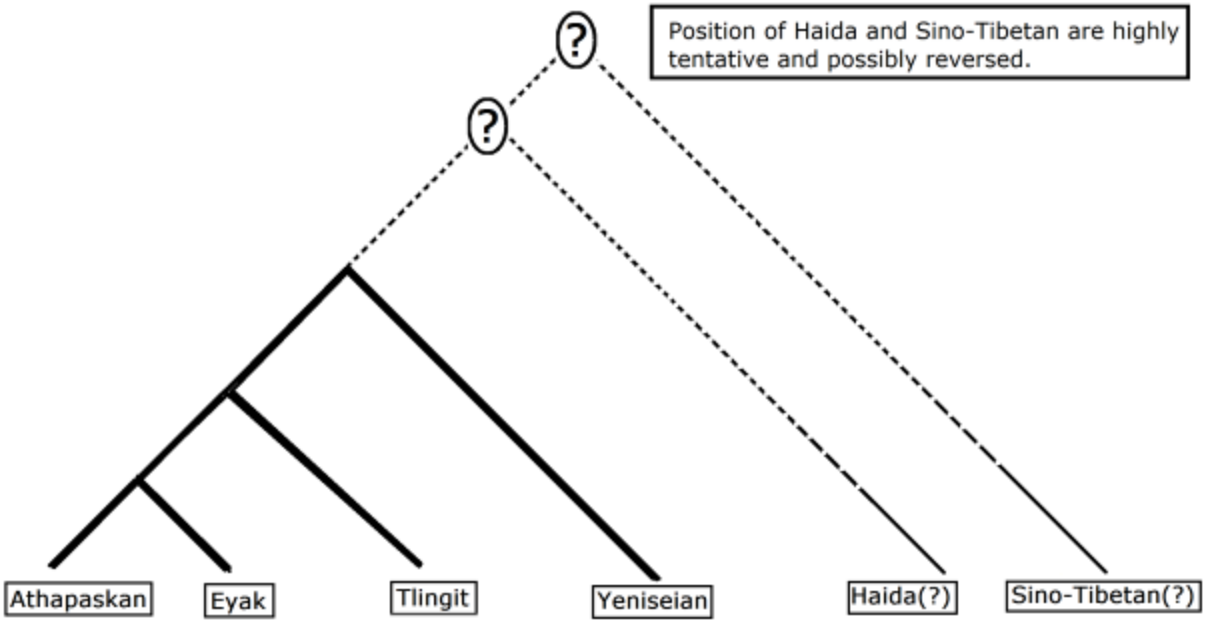


Figure 3-1. Tentatave (Sino?)-Dene-Yeniseian dendrogram (author's rendition). No time dimension is depicted, although the vertical axis is meant to imply a relative chronology. Author's proposal based on discussion in Vajda (2010b).

Figure 3-2. Map of Yeniseian territory in eighteenth century (green), and the Xiongnu Empire circa 2000 years ago (orange). Ethnographic Ket are the black dots in the northern part of Yeniseian territory. Courtesy Wikimedia commons.

Figure 3-3. Apache umbilical pouch stitched with leather and horsehair, white shell and turquoise pendants, early twentieth-century. Image courtesy of the Arizona Antique Centre, Scottsdale AZ.

A. B.

Figure 3-4. Comparison of forged daggers of Athapaskan Subarctic Canada and the Upper Yenisei River, Siberia. A) Seven inch Tahltan (or Gwich'in) forged steel dagger with leather-wrapped grip; 1850 or earlier. Private collection, Discovering American Indian Art Exhibit, UTK, exhibited 29 Aug 2009 through 10 January 2010. Photograph by author. B) SHM 1669/1; Twelve inch forged iron dagger from the Tagar Culture, Southern Siberia, Krasnoyarsk Region, near Minusinsk, fifth century BCE**.** Image "B" from www.hermitagemusum.org, courtesy of The State Hermitage Museum, St. Petersburg, Russia.

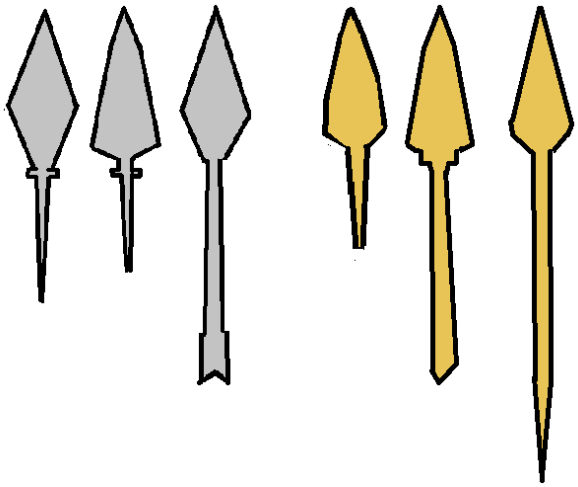


Figure 3-5**.** Comparison of 'tanged'-type forged metal arrowheads of Eurasia and the Athapaskan Subarctic. The three on the left are Altaic- and Xiongnu-type forged iron arrowheads. The three on the right are Athapaskan tempered copper arrowheads. Author's sketch made from photographs in Franklin et al. (1981:28), Witthoft and Eyman (1969:21) and Karasulas (2004:23, 49).

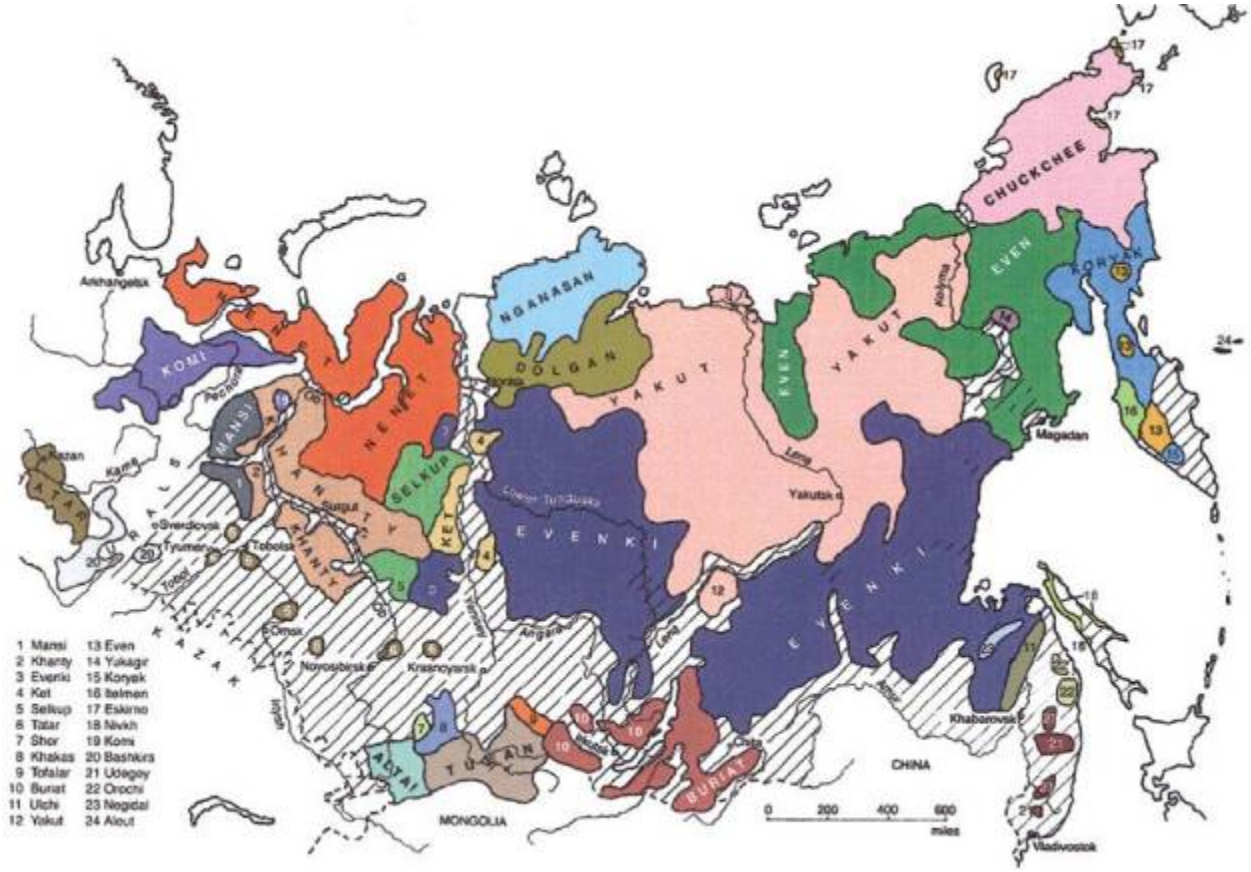


Figure 3-6. Native Siberians in the mid-twentieth-century. Cross-hatched areas colonized by Russians (Uinuk-Ool 2003:232); courtesy Wylie-Liss Inc.

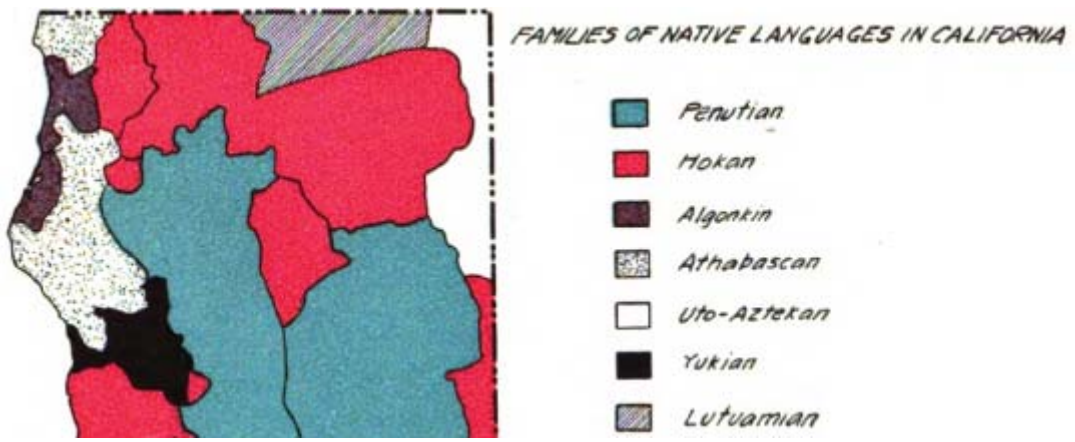
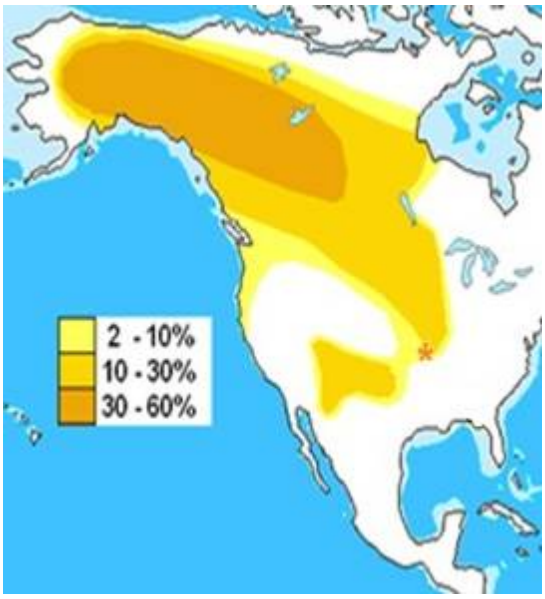


Figure 3-7. Athapaskan/Algic Interface in Northwest California (Dixon and Kroeber 1919).

A.



B.

Figure 3-8. Na-Dene language distribution in comparison with Haplogroup C3 distribution. A) Na-Dene languages (shaded area). Author's sketch. B). Distribution of haplogroup C3b-P39 in North America (Greenland not shown). Red asterisk marks northeastern Oklahoma, where Cherokee and Creek were relocated after 1835. Image 'B' Modified from illustration by Mauricio Lucioni, courtesy Wikimedia commons

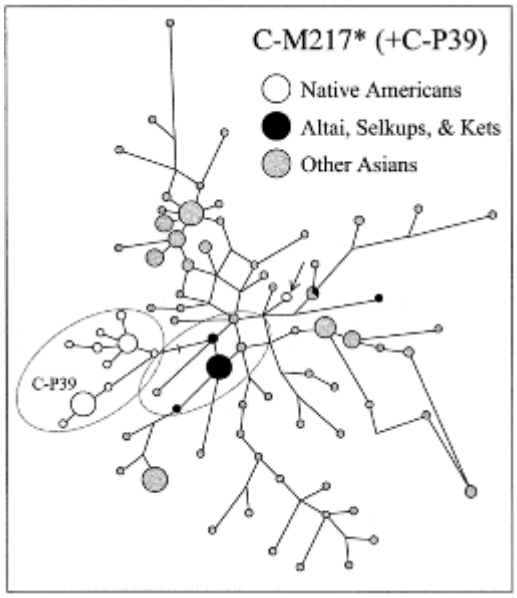


Figure 3-9. Median-joining microsatellite network for haplogroups CM217* and C3b (oval, far left) with the position of the P39 mutation denoted by a cross-hatch within the right-most oval. Wayuu individuals outside P39 cluster indicated by arrow. Haplotypes are coded in white, black, or gray by population system, with haplotype sharing indicated by pie chart divisions (Zegura et al. 2004); by permission of Oxford University Press.

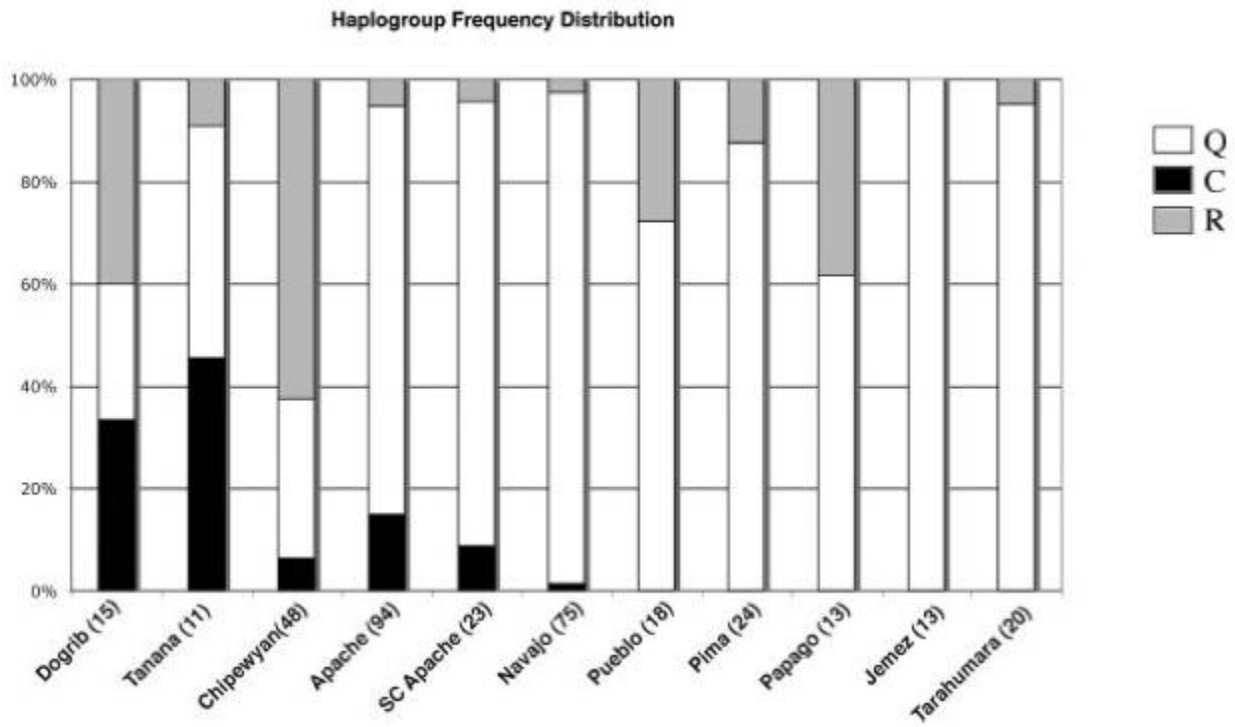


Figure 3-10. Athapaskan and Southwestern Y-chromosome haplogroup frequency distribution (Malhi et al. 2008); courtesy Wylie-Liss Inc.

CHAPTER 4
SELECTION OF FIELD-SITES AND METHODS OF ANALYSIS

Premise for Collections Research

Overview

One of the challenges of this dissertation is to address the relationship between strong complex bow types used by nineteenth-century Athapaskans in the three major geographic blocs (Northern, Southern and Pacific Coast), and to assess their relationship to each other and to those of neighboring populations. Geographic distribution of bow types may correlate to linguistic, genetic and ethnological data. Chapter 2 reviewed the history of the study of the Athapaskan expansion, from the perspective of the four subfields of anthropology (linguistics, archaeology, ethnology, and human biology). Chapter 3 brought this picture up to date with a review of recent linguistic scholarship linking Athapaskans (Na-Dene) with Southwest Siberians (Yeniseians), exploring the immanent potential impact of this linguistic paradigm shift upon ethnology and molecular genetics.

In Chapter 4 I will lay out the basic methodological and analytic considerations involved in the analysis of the material culture. First I will provide a background and description of the basic method employed. Then I will provide an overview of the filedwork and institutions visited. Next I will describe in detail the manner of measuring and cataloging individual complex bow specimens. Finally I will assess the significance of these archery artifacts upon Athapaskan material culture, and whether the spread of thre technology in question is a possible corollary to the Athapaskan expansion.

Strong complex bows (generally termed sinew-backed bows) are presumed to have diffused southward from Alaska to California and the Southwest during the late

first or early second millennim CE (Blitz 1988; LeBlanc 1999:101). This timeframe is very similar to the presumed timeframe of the Athapaskan expansion into both of these regions, and a number of authors have suggested this is not a fortuitous coincidence, but a reflection of the actual transmission of the weapon in the hands of Athapaskan speakers (Baldwin 1997; Downs 1972:6; Krantz 1977:47-49; Paper 1993; Steward 1937:83-87). Assuming a predominantly north-to-south migration of Athapaskan speakers during the Common Era, then the material culture and technology of Northern Athapaskan societies may retain some characteristics of the ancestral state of similar items observed among the Athapaskan daughter cultures of the Apacheans and Pacific Coast Athapaskans. I am thus using a synchronic, spatially-distributed dataset (nineteenth-century bow forms) as a proxy for a diachronic analog which is the sparse archaeological footprint of sinew-backed bows (and bows in general).

Evolutionary Anthropology: Ethnogenetics versus Phylogenetics

My method draws from those used in evolutionary archaeology, as noted by Hector Neff:

> Like other phenotypic characteristics, the behaviors used to make artifacts at a particular place and time (and therefore the artifacts themselves) can be explained by reference to history (descent, inheritance of information) and selective retention (Neff 1992:141).

In other words, relationships of common descent promote selective retention of variation, and these patterns provide the basis for application of evolutionary theory to material culture. But the relationship between evolutionary theory and anthropological archaeology has been uneasy at times, as debates surrounding sociobiology and the cultural-processual orientation of mid-twentieth-century scholarship have ebbed and flowed. O'Brien and Holland write of the un-Darwinean nature of much of this theory:

> Evolution assumed a place in the new archaeology of the 1960s, but, similar to its status in anthropology in general, it was not Darwinian in nature. . . . Archaeologists scrambled to incorporate the trappings of cultural evolution into their arsenal, concerning themselves with searching for archaeological correlates of ethnographically known forms of kinship, sociopolitical organization, and so on. Once these were found, archaeologists then attempted to understand how one form transformed itself into another form. Implicit in these exercises was the notion of an evolutionary progression from simple to complex . . .—in short, directional evolution (O'Brien and Holland 1990:33).

One major flaw in many nominally evolutionary approaches to archaeology in the last century was the overt desire to discover "general lawlike principles" governing human behavior, and the haphazard, uncritical reappropriation of concepts and terms from physical and natural sciences (O'Brien and Holland 1990:33; see also Kehoe 2010). O'Brien and Holland's interest in specifically Darwinian analysis of material culture improves on the above by recognizing the explicitly non-directional nature of evolutionary change; such change may have adaptive significance, but "not all features are adaptations." They continue: "features that once were adaptations may not have been adaptations under different environmental regimes." And they conclude: "simply because a feature evolved as an adaptation does not imply that the feature was an end-all solution to a problem" (O'Brien and Holland 1992:44). I am interested in the selection and retention of bow traits through time and space, which may or may not be adaptive, but which nonetheless imply some form of descent through retention of inherited information. This is a cladistic (or phylogenetic) model of evolution.

Simultaneously, I am cognizant of John Moore's (1994) ethnogenetic critique of cladistic theory which notes that protolanguages and protocultures are complex entities with multiple interfaces involving neighboring societies, and that their 'daughter' populations are never simply evolved forms of their parents, but hybrids between

multiple antecedent cultures. In this sense, Darwinian evolution is an imperfect analogy because a direct linguistic ancestor can never be assumed to be the source for all variation within a material cultural or technological lineage. There are numerous opportunities for contact-induced change in material culture (like any aspect of culture), and there are many aspects of Apachean and Pacific Coast Athapaskan societies which are demonstrably *not* a product of migration with the retention of features found among their Northern Athapaskan kin, despite their remarkable collective linguistic retention. The pedigree of these ideas about ethnogenesis goes back to Kroeber, who writes:

> Cultures are always tending to equate themselves by imparting their characteristics to one another, even while another set of impulses pushes each of them toward particularistic peculiarity. . . . [T]he course of organic evolution can be portrayed properly as a tree of life, as Darwin has called it, with trunk, limbs, branches, and twigs. The course of development of human culture in history cannot be so described, even metaphorically. There is a constant branching-out, but the branches also grow together again, wholly or partially, all the time. Culture diverges, but it syncretizes and anastomoses too. . . . A branch on the tree of life may approach another branch; it will not normally coalesce with it. The tree of culture, on the contrary, is a ramification of such coalescences, assimilations, or acculturations (Kroeber 1948:260-261).

Kroeber's illustrations of the"tree of life" and the "tree of culture" are reproduced in Figure 4-1. This distinction between biological and cultural 'evolution' made here is useful. The "tree of life" illustrates the phylogenetic (cladistic) model appropriate for the natural sciences. The "tree of culture" illustrates the ethnogenetic (reticular) model most appropriate for the social sciences and history. These two models are also called "vertical" and "horizontal" (Mulder et al. 2006). But it is important not to overstate the difference between the two branching patterns. Kroeber's reticular network is a good model of cultural change, but it can also describe biological processes—admixture and hybridization are reticular mergers of biological traits coalescing in ethnogenetic fashion.

Likewise, the more typically 'treelike' model of biological evolution may be appropriate for instances of culture change where isolation in time and space prevents ethnogenetic coalescence. For example, in the case of long-distance mass migration and transmission of novel culture traits from elsewhere, the phylogenetic model may still have merit in cultural settings. This is especially the case with large-scale ethnolinguistic expansion events as in the Athapaskan case. Peter Bellwood notes:

> Reticulate models . . . stress the importance of continuing processes of interaction between contemporary communities. Phylogenetic models . . . imply dispersal by culturally and linguistically related populations from common origins. . . . Both are necessary: reticulate models . . . can overlook the large-scale patterning visible on continental and millennial scales in the linguistic and archaeological records. . . . Largescale and fairly integrated colonizations *did* happen in prehistory; human cultures and languages can, to varying degrees . . . be organized in phylogenetic arrays. The generation of human diversity in the past has not been entirely reticulate and dependent on processes of *in situ* interaction between peoples of different ethnolinguistic background. Neither has it been entirely radiative and dependent on adaptation in isolation (Bellwood 1996:881, 888; emphasis original).

Both kinds of analysis are relevant in the case of material culture and the Athapaskan expansion, but the question becomes how best to juxtapose and articulate them. In seeking to bridge this same divide, Kenneth Weiss and Frances Hayashida state "[w]e have wondered if there might be an alternative where differences in training and theoretical outlook lead to vision rather than division" (Weiss and Hayashida 2002:141). As others have suggested, to successfully integrate cladistic and ethnogenetic models "we must be more creative in our use of data" (Mulder et al. 2006:63). Mulder et al. continue (using 'horizontal' to mean reticlular and 'vertical' to mean cladistic):

> To date, only geographical proximity is used as a measure of the potential for horizontal transmission. If we are to uncover past opportunities for cultural diffusion, we will need other sources of evidence for historical

> interconnectedness among societies, such as trade, loan words, and trees modified to show intergroup contact histories (Mulder et al. 2006:63).

In short, both reticular and cladistic models are applicable to both biological and cultural settings. Mass movements of (multiethnic) societies from north to south took place during the middle Common Era, and among these, Athapaskan speakers were most prominent. During roughly the same period, the south to north movement of Uto-Aztecan speakers during the Numic Expansion also took place (Miller 1986:100-104). Despite the aforementioned caveats, the careful analysis of spatial variation in bow morphology may help reveal cultural currents underlying the physical transmission of these items in the hands of mobile culture bearers, particularly Athapaskan speakers.

Athapaskan speakers are the group with the widest documented presence in multiple areas of the continent where this particular weapon was used, from the Bering Sea to Sonora; from Hudson's Bay to Humboldt County. Athapaskans are thus plausible candidates for the rapid transmission of complex archery between circa 1150 and 1400 CE. But all sinew-backed bows (not just putatively Athapaskan ones) are relevant to understanding this process, as this rapid technological diffusion was never linguistically bounded; it must have encompassed multiple non-Athapaskan societies of North America who were likewise involved in its transmission.

Basic Method Employed

My method was to map the variation in weapon design throughout a geographic zone bounded on most sides by historical Athapaskan-speaking communities. Where an in-person visit to a particularly important ethnographic collection was impossible or impractical, I was able to gain some relevant artifact descriptions via correspondence with museum curators or simply through access to online collections databases. Where

significant gaps in the record occurred due to lack of preserved materials (especially in British Columbia), I was compelled to supplement the meager record with less-than-standardized bow-descriptions culled from ethnographic literature. The result is a comprehensive dataset for the sinew backed bow in western North America.

Sample Size and Number of Institutions

Between November 2009 and August 2010, I made periodic scheduled research visits to twelve museums and one large private collection in ten different states. I examined directly more than 250 Native North American bows in addition to an assortment of various other ethnographic artifacts. I measured and photographed 236 of these weapons (some were excluded due to inadequate provenance and/or geographic irrelevance). This large and heterogeneous dataset was supplemented using artifact descriptions from various online databases, also those generously provided to me by museum professionals in the US and Canada, and finally those culled from an extensive search of the literature. The addition of these extraneous sources means that a total of 242 bows are completely documented to the extent possible, with approximately 50 additional specimens in varying degrees of completeness in terms of measurement (this number includes only weapons not directly examined by me). Weapons incompletely measured are still useful for comparison and reference (especially for rarer types) but cannot be systematically included in my tables and analyses.

Russ Bernard writes: “all samples are representative of *something.* The trick is to make them representative of what *you* want them to be” (Bernard 1995:96; emphasis original). From the outset, I sought to make my dataset representative of something, in this case the contact-traditional-era complex bowyery of Athapaskan societies.

‘Contact-traditional’ refers to the period (variable depending on location), after European contact but prior to the most extreme assimilation and acculturation, when material culture was still somewhat reflective of pre-contact norms. Many Athapaskan languages possess terms derived from the Proto-Athapaskan root word, **ts’əɬ-təŋʔ,* for the sinew-backing technology involved (Victor Golla, personal communication 7 November 2009). The only way to make sure that the field dataset is legitimately reflective of historical context (to the extent possible) is through adequate unbiased sample size. One could make the case that the best sampling economy could be achieved by selecting the largest, richest and most diverse collection and just camping out there for a few weeks to exhaustively document all the data represented. However this would be analogous to an ethnographer attempting to capture the character of a society by surveying only the admittedly diverse population of one of its major city centers. While the individuals represented in such a survey would indeed include a broad spectrum of the society at large, they would likely also possess subtle unifying characteristics common which would distinguish them from the folks who were not present in the urban hub. As Bernard further writes:

> There is always going to be a trade-off between greater accuracy and greater economy in sampling. In a study of households in a county, you *should* take a few households from each community (cluster) rather than study many households in a few randomly chosen communities. The problem is that this may force you to spend more in both time and money on travel than your budget will allow. So your rule actually becomes: Study all the highest level clusters you can afford (Bernard 1995:74-75).

If I had limited myself to the single highest-level cluster in my sample (that is the National Museum of the American Indian) and if I had allowed myself two weeks to work there (rather than the actual two days), then I would have gathered a very large dataset in a relatively short amount of time. But one large sample from a single high-level

cluster would not be sufficient, because the data would then represent the biases inherent in that particular collection. The character and composition of even large and diverse collections (like cities or towns) are shaped by the interests of particular founding collectors and/or the history and ethos of the people and institutions involved. Particular types of objects may be coveted in one time or place, and overlooked or dismissed in another. Every collection I visited had unique character traits and attributes distinguishing it from others like it. Some collections may disproportionately include 'niche' items satisfying collector's personal interests; others may have aspired to geographical diversity and comprehensive representation, but overlooked mundane or commonplace items,while many others appear to have been amalgamated by convenience, through a variety of haphazard sources.

In particular, the most comprehensive and diverse collection (NMAI) has no Northern Athapaskan complex bows whatsoever; these crucial data (for my purposes) would have been virtually absent from my study if I had limited my scope to just a few of the most obvious major museums. Some museums (through correspondence or through online database access) did provide me with a clear idea of what to expect before I arrived. But when such 'pre-screening' data are limited (as it was to varying degrees for a number of my target institutions), then research visits are hit or miss. It requires a bit of faith to soldier on when an expensive research trip yields little useful data. Yet such visits may be fortuitous as I later found out. The only place where I found more than one Alaskan Athapaskan complex bow in the same institution was at the San Diego Museum of Man, where I had absolutely no idea what to expect before I visited in person.

By visiting as many museums as I could afford to between November 2009 and August 2010, I was able to get a much more representative view of Athapaskan archery technology, and Native American complex archery in general, than if I had taken the more economical route (both in terms of time and money) and examined a few higher-level clusters exclusively. In another illustration of this point, my Apachean sinew-backed bow dataset is very large (about 67 bows). This includes bows from almost every commonly recognized Apachean subgroup, including (in descending order of prevalence) Navajo, Jicarilla, Mescalero, Western Apache (White Mountain), Chiricahua, and Plains Apache (Kiowa-Apache). The only Apachean people with sinew-backed bows not represented in my dataset are the Lipan Apache from the southernmost Texas Plains, a group whose population in 1894 was estimated at only forty individuals and was thus by far the smallest Athapaskan subgroup recorded in that study (Morice 1894:16). No single museum possessed bows from all six of these different Apachean cultural units—it was necessary to visit more than one museum to see all of them. The 'sample' is less of a selection of a larger population than it is a snapshot of the whole population itself. The study includes nearly every bow (of a certain type) available for examination at each museum I visited, with a few additional specimens culled from other sources.

Ethnographic and Archaeological Materials in Museum Collections

The vast majority of the artifacts in my database are from ethnographic collections of the late nineteenth- or early twentieth-centuries (the reservation period) owing to the fact that the objects of primary interest to me (sinew-backed bows) are organic and therefore not well preserved in the archaeological record. Ethnographic materials thus serve as admittedly imperfect proxies for nonexistent archaeological

remains. One should be highly critical of any attempt to use modern samples to test hypotheses about ancient migrations, but it is certainly no less reasonable than the common practice of molecular anthropologists using DNA from contemporary Native Americans from as far away as Alaska and Tierra del Fuego, in order to make inferences about the Pleistocene population of a small strip of submerged land in the Bering Sea (Tamm et al. 2007). Most of the bows I analyzed were collected from living informants in the ninetheenth century or later. A small number of archaeological specimens are nonetheless represented in my data. The number of relevant artifacts has varied substantially from institution to institution. For a combination of reasons, some visits allowed more leisurely perusal of collections, while other visits were more efficient and selective by necessity. The decision to examine certain objects and not others because of time constraints was very difficult. Hindsight notwithstanding, the data collected are sufficient to address my primary research question about complex archery as a unifying feature of Athapaskan material cultures in three different culture areas.

Strong Complex Bow Documentation and Measurement

The primary motivation for my study is to test the hypothesis that the diffusion of the sinew-backed bow in western interior North America occurred in correlation with a late-prehistoric Asiatic derivation of proto-Athapaskan culture. To bridge the temporal gap from late prehistory to the ethnographic past, it will be necessary to demonstrate a distinctive physical correspondence (indicating a likely design-template connection) between Athapaskan weapons systems in widely removed districts. Assuming that such correspondences are found to be largely limited to Athapaskans, it will substantiate the hypothesis that Athapaskan migrants retained technologies originating

in their ancestral homeland(s). My method thus represents an extension, to the realm of material culture, of the method of ethnographic reconstruction as employed by Perry (1983). As the key material cultural element in this hypothesis, the sinew backed bow is the primary focus; nevertheless, other material cultural objects bearing on questions of Athapaskan origins and migrations are relevant, and these objects (e.g. footgear, basketry, ceramics, edge tools etc.) will figure in my analysis, albeit in a less systematic and more qualitative manner.

The first step taken when examining a sinew-backed bow is to note the catalog number and any relevant information about its provenance (e.g., culture and place of origin, date of acquisition, donor, etc.). The quality of information present for any given object varies substantially, from extensively documented professional collections of famous anthropologists like Cornelius Osgood, James Teit, and Edward Sapir, to the more idiosyncratic donations of various obscure philanthropists from their eclectic private collections, often having few if any provenance notes other than the donor's name and date of acquisition. Some of these items are grossly inaccurately cataloged; such as, a California bow at NMAI that was attributed to arctic Alaska, and a Plains or Southwest–style weapon at Yale that was attributed to the Florida Seminole.

The next step is to note any unusual or distinguishing features. These include (for example) materials layered over or under the backing, the colors and pattern of paint or other decoration, leather or textile materials wrapped around the grip, attached ceremonial objects, engravings in the wood, etc. Then I note the general shape of the bow, its component raw materials, the condition of the string (if present), and the cross-sectional shape of the stave at center, midlimb, and tip. I developed my own

nomenclature for expressing these formal attributes (Figures 4-2 and 4-3). "No two authorities agree on the classification of bows" (Hamilton 1970:45), and therefore (unfortunately) the use of bow-terminology in the literature is extremely imprecise.

I use the most straightforward nomenclature possible, following Downs (1972) in using the less-common term 'strong complex bow' in place of the more common 'sinew-backed bow' or 'composite bow.' The use of the term 'composite bow' is especially problematic and imprecise. Driver and Massey (1957) use it to refer to all sinew-backed bows, while Hamilton (1970) uses it for a narrow subset of sinew-backed bows which are made with at least three distinct stave components, otherwise referred to as compound bows. The term 'sinew backed bow' is more satisfactory, except that elastic backing materials are not limited to sinew. Babiche (i.e. rawhide or gut thongs) may be used instead, as well as other fibers (e.g. strings and yarns of various types) all of which appear occasionally on Arctic bows and even more rarely on Athapaskan bows. Old-world composite bows may also be backed with a flexible wood like rattan, so using the term 'sinew-backed' to refer to the entire technological class can be misleading. The term 'strong complex bow' may lack the general literary currency of these other terms, but at least it is accurate in its application to all of the cases under consideration. The term 'self bow' is much less problematic, invariably referring to bows that are simple, that is lacking longitudinal backing or other 'composite' reinforcements.

Basic Bow Features and Vocabulary

I will now list the major anatomical features of the strong complex bow as I understand them, remembering that there may be variation in the literature as far as how these terms are used. In addition, this list includes other terms and nomenclature relevant to traditional bowmaking.

BABICHE. Conditioned animal-based cordage, most often hide, gut, or sinew, often used to make bowstrings or reinforcement for the back of a complex weapon. In the present document, it refers *only* to materials other than sinew, which has a distinctly fibrous appearance compared to other forms of babiche. When I use *babiche*, I refer to hide or gut.

BALEEN. Whalebone, colloquialy; a horn-like substance from the jaws of filter-feeding whales, often used as a substitute for horn in true composite bows.

BACK. The surface facing away from the archer when the weapon is used.

BACKING. The elastic material used to reinforce the back, usually sinew or babiche, rarely other fibers.

BELLY. The surface facing toward the archer when the bow is used, often reinforced with compression-resistant horn or bone lathes in true compound bows.

BOWSTRING. The cord which acts as a spring in conjunction with bow. Sinew or babiche are preferable because they provide some elasticity, although inelastic plant cordage is serviceable where resources are limited.

BOWYER. One who manufactures bows, i.e. a bowmaker.

BOWYERY. The bowyer's craft, i.e. bowmaking.

BRACE. To string the bow (verb), not to be confused with brace (noun) which is another word for bracer, i.e. wrist guard.

COMPLEX BOW. A broad class of bow including virtually any non-self bow, principally any bow with some sort of longitudinal reinforcement of the back (e.g., composite bows, compound bows, sinew-backed bows and horn bows).

COMPOSITE BOW. In the most specific usage, a 'true' composite bow is a complex bow featuring both an elastic backing material (usually sinew or babiche) and a belly reinforcing material (usually horn, ivory, bone, or baleen). An 'elementary' composite bow lacks the belly reinforcement (i.e. a sinew-backed bow). In general usage, composite bow is a synonym for any complex bow.

COMPOUND BOW. In traditional usage, a bow with multiple stave-segments spliced together. Not to be confused with contemporary usage referring to a modern bow that uses a levering system (usually of cables and pulleys) to bend the limbs.

GRIP. The region near the center of the bow, often covered with textured wrappings, where the archer's non-dominant hand grips the bow during use.

HORN BOW. A complex bow similar to a true composite bow, only lacking the wooden core/stave. The bow itself is made of horn or ivory, etc. Horn bows are often compound bows.

LIMB. The portion of the bow between the grip and the nock.

NOCK (BOW). The platform-like incision or projection near each tip of the bow, which helps to grip the bowstring when the bow is braced. Not to be confused with the nock of an arrow, an incision on the back of the arrow gripping the bowstring prior to release.

RECURVE. Outward bend of the limb tips typical of reflexed bows.

REFLEX. The condition of a bow that is braced when bent in the direction counter to the 'natural' curvature of the unbraced bow. A substantial majority of complex (backed) bows are reflexed and/or recurved.

SELF BOW. The simplest and most common form of bow, made with a single-piece wooden stave with no longitudinal reinforcements; also known as a simple bow.

SINEW-BACKED BOW. The major sub-type of complex bow found in North America, consisting of a bow-stave reinforced with sinew applied longitudinally to the back surface; also known as an 'elementary' composite bow.

SIYAH. Tip extension on some bows, serving to arrest the motion of the bowstring after release of the arrow, resulting in a more uniform release of the bow's tension. Siyahs are often vestigial (non-functioning) in North America.

STAVE. The term for the selected and prepared material (timber or occasionally horn) used for the bow itself, in its rough state, or the term for the wooden core of the bow in the case of true composite bows.

TIP. The portion of the bow between the nock and the terminus.

WRIST GUARD. A brace; an object to protect the archer's wrist (the one holding the bow) from the abrasive percussion of the bowstring as the arrow is released. The wrist guard may be a curved plate with straps worn on the wrist like a bracelet (Eng. *bracelet* = "small brace"), or it may be a string-stopping wedge-shaped device attached to the bow itself, as it the case with many Alaskan Athapaskan bows.

Wood Type

The wood-type of the bow itself is noted only infrequently (at best) in museum catalogs, except where a single species predominates within a given culture-area (e.g.,

yew in California). The unique cellular structure of a species of wood can be determined with the use of a hand-magnifying lens and the appropriate field-guide for the wood-anatomy of the species in question. While this information would be most welcome, the necessarily exacting determination would slow documentation efforts considerably under circumstances where time is a primary constraint. Furthermore, I am not trained to identify specific wood-types originating from regions as far-flung as Alaska and Arizona. I am able to make educated inferences about the woods most likely used in different regions based on my close reading of the relevant literature, and this must suffice.

Although material constraints may have a significant impact on the form of the bow itself (and are therefore relevant to my analysis), I am less interested in raw material analysis for its own sake, because (as is the case with ceramic analysis) locally sourced raw materials are less relevant to the question of ultimate origins for a technology, where long-distance transmission is suspected. Bows made in different regions vary widely in their locally-derived raw materials, but may nonetheless derive from a single antecedent concept or template which is adapted to local circumstances. I am primarily interested in long-distance relationships and the conceptual undercurrents of technology which may reveal them; variation in locally available materials is of secondary importance.

Units of Measure and Measurement Protocols

The decision to use English units (inches) rather than metric units (centimeters) was made *ad hoc*, because I began my fieldwork with a cloth tape which used only inches. Subsequently, I came to prefer inches for several reasons, and elected to continue using them. The classical anthropological literature (and contemporary

literature by American archery enthusiasts) almost invariably uses English units to describe bows (Allely and Hamm 2002; Mason 1894; Murdoch 1885; Osgood 1937; Pope 1918; Rausing 1967). Also, many bows seem to be naturally well suited to measurement English units. For example, the vast majority of Pacific Coast Athapaskan bows I measured fall within the range of 30 to 40 inches long, and a similar majority of Apachean bows are within the range of 40 to 50 inches long. Certain other measurements (like width at grip and at tip) also seem to lend themselves to inches and fractions of inches.

My initial assumption was that the bow length would vary significantly depending on its state of bracing and resultant curvature (that is, whether it was measured along its curvature or along the taut bowstring). But I quickly realized this was only the case for the most heavily curved Pacific Coast weapons. The vast majority of bows vary by less than 5% depending on how the measurement is taken. For most subsequent bows, I elected for the most straightforward route (a tip-to-tip measurement ignoring the curvature of the wood), with the caveat that this measurement slightly underrepresented the true length of the stave for moderately curved braced bows. Severely curved braced California bows still required a measurement taken along the curvature of the bow, because the shorter distance can be found to be more than 10% shorter than the actual stave length. I elected not to record string-length as a separate measurement, because so many bows in museums have no string (or a fragmentary string) that a consistent measurement could not be taken.

After measuring the overall length of a bow, I then would measure width and thickness at three locations, near the grip (center), near the midlimb (midway between

the center and the nock), and near the end (just below the nock). The next step was to examine and classify the nocks themselves, that is the platform-like incision or projection (i.e. concave vs. convex nock), usually about one inch from each tip, where the string is braced (Figure 4-4). Nocks are often incised in the sides and/or back (never the belly) of the bow. They may also be 'built-up' with a collar-like piece of sinew or babiche around the whole circumference of the tip, frequently secured in place with the longitudinal backing (usually underneath the backing) and/or through transverse application of a sinew reinforcement strips. Indeed some authors refer to such additions as "shoulder nocks" (Allely and Hamm 2002:201). I prefer the term I have coined, 'collar nock', because it emphasizes that the nock is a 360-degree loop (on all sides) rather than a 'shoulder' which is a projection from just the sides (not the front or back).

In the Plains, Great Basin, and Southwest, nocks may be virtually absent in some cases, with the bowstring simply looped tightly around the contracting tip of the bowlimb. The nocks may be very subtle or obscured by the sinew wrappings, and individual bows may have idiosyncratic variation in nock form, or similarities to more than one common pattern. In 'nockless' weapons, heavy usage may result in a grooved-impression of the bowstring in the tip of the bow, where a normal incised nock would appear. Hence it is difficult to establish discrete types in many locales. Standardization of nock-shape appears much greater in some regions than in others. I finally make a rough accounting of the number, size and general distribution of any extant transverse reinforcements (usually sinew wrappings) which serve the dual function of strengthening the bow itself (especially when placed around an imperfection in the wood) and also help to secure the sinew backing or sculpted nocks.

Bow Typology

It is usually straightforward to make the most basic typological classifications at this point. The North American sinew-backed bow falls in two major types. In what I term the 'glue'-type, the elastic backing is directly molded while moist and pliable so to adhere to the back of the bow in longitudinal strips, by means of lacquer-like adhesive (usually or fish-glue, animal-glue or pitch). This type is exclusively associated with American Indians, and is also essentially the same as the backing method for East Asian and Central Asian composite bows. The 'glueless'-type, in contrast, is made by plaiting and wrapping dry sinew cables onto the bow with the bulk of the cordage running longitudinally along the back, held in place by a few transverse lashings. This type is mostly associated with Eskimo-Aleut speakers from Siberia to Greenland. Athapaskans (both Northern and Southern) are the only groups known to possess both the glue-type and the glueless-type of weapon (Driver and Massey 1957:355). See Figure 4-5 for a map of the distribution of the two complex bow types, overlaid with a map of the Na-Dene languages.

A rudimentary analysis can classify most complex bows according to a basic typology established in the literature. The 'glue'-type weapon is also called the 'close-backed' or the 'sinew-lined' bow; the 'glueless' type is also called the 'free-backed,' the 'cable-backed,' 'trussed' or 'sinew-corded' bow (Longman and Walrond 1894:47; Mason 1894:643; Wissler 1914:456). The 'glueless'-type is further divided into at least four subtypes, with two simpler subtypes found in south Alaska and Cumberland Gulf (southeast Baffin Island) respectively. Murdoch places these forms closer to the prototype, whereas two allegedly more specialized or derived varieties are found in the High Arctic and Bering Strait (Murdoch 1885). Hamilton (1970:51) disagrees with

aspects of Murdoch's diachronic typology, instead regarding the Cumberland Gulf type as another more specialized (i.e. derived) bow whose crude appearance is dictated by extreme material constraints of the region, rather than mere archaism. It is fairly straightforward to classify most Eskimo and Aleut sinew-backed bows according to the Murdoch classificatory scheme, but some of the Athapaskan glueless bows I have examined for this study deviate somewhat from this scheme, and as appearing independent derivations from the generic south Alaskan protoform. Through my analysis, I will attempt to determine if there is cause to define a new typological category (type or subtype) for Athapaskan glueless strong complex bows.

The 'glue'-type bows fall into three approximate categories, (1) a shorter, wider type common to the Pacific Coast Athapaskans and their neigbors, (2) a longer, narrower type common to the Great Basin, Plains, and Southwest, including Southern Athapaskans (3) the very short, narrow horn-bows of the Plateau and Plains, which (like many Arctic bows) is correctly classified as a true compound bow, because it includes multiple pieces of varying materials, with spliced lathes of horn or baleen (a.k.a. whalebone) often riveted and bound together with an abundance of sinew. This type may or may not have a wooden core at all. Unfortunately, preservation of glue-type weapons in the Subarctic is too sparse to allow generalization, making it difficult to precisely categorize the Northern Athapaskan 'glue'-type sinew-backed bows documented by nineteenth-century ethnographers.

Through the use of categorical substitutes for continuous variables measured in the field, I intend to find the approximate position of Northern Athapaskan glue-type strong complex bows within the East-West (Pacific-Plains) continuum. The late

nineteenth- and early twentieth-century sources documenting Northern Athapaskan glue-type strong complex bows include a few rough measurements and sketches of unique types, including some specimens with unusual features. These will be analyzed to the extent possible, substituting extrapolations for the firsthand measurements actual weapons themselves which were unfortunately not collected or preserved by any of the authors who described them.

The most common Northern Athapaskan bow type in ethnographic collections is a specialized type of long self bow, most commonly made of birch and featuring an attached wrist guard. This weapon is well studied by Foley Benson (1975). Because some South Alaskan complex bows appear to be hybrid types featuring Athapaskan-style attached wrist guards and Eskimo-style glueless sinew backings, the Athapaskan self bows I observed will also be analyzed to determine their possible morphological continuity with the 'hybrid' weapons, in the effort to determine whether the hybrids are themselves indebted more to either parent type.

Museums Visited

Below is a brief chronological summary of each of the collections I have visited and on what dates, followed in turn by a list of the institutions I was unable to physically visit, but which nonetheless provided data via the World Wide Web and/or through correspondence with helpful staff members. Table 4-1 is an alphabetized digest of this information, along with those museums that I did not visit in person. My selection of institutions was made on the basis of a number of flexible criteria, but travel cost was the main limiting factor. For a collection to be worth a long and expensive journey there should ideally have been a significant quantity of sinew-backed bows, including those of Athapasakan manufacture. While there were a few minor disappointments (that is,

collections yielding less than anticipated or other logistical setbacks) the vast majority of my fieldtrips were eminently worthwhile, yielding ample data for analysis.

Wake Forest University, Museum of Anthropology (WFU)

On November 19th, 2009, I visited the anthropology museum on the campus of Wake Forest University in Winston Salem North Carolina. It is conveniently located near my family home. This collection possesses a number of relevant items of Athapaskan material culture, including southern Plains footgear, a Navajo-Pueblo arrowhead, Navajo-Ute baskets, and (reputed) Northern Athapaskan baskets.

Florida Museum of Natural History (UFL)

On December 10th, 2009, I visited the Florida Museum of Natural History in Gainesville, Florida. Most of the relevant objects are part of the Pearsall Collection of American Indian Art, amassed by private collector Leigh Morgan Pearsall (b. 1874, d. 1964) and bequeathed to the University of Florida upon his death. The Pearsall Collection is the largest ethnographic collection in the southeast, and most of the objects were made between 1890 and 1920. There are five sinew-backed bows in this museum. Two of these are the glueless type from the Arctic, and one of these is a three-piece compound bow. The other three complex bows are of the glue-type, from the Plains and/or Southwest. Finally, there are three self-bows of the type made by California Athapaskans. In addition there are some fine examples of Plains footgear, and a large collection of ornate basketry including specimens from both Northern and Southern Athapaskans.

Frank H. McClung Museum (UTK)

I visited the museum on the campus of the University of Tennessee, Knoxville, on December 15th and 16th 2009, where I viewed the McClung Museum's extensive

collections, including Navajo and Apache baskets, garments, footgear, and arrows. I went during the Discovering American Indian Art Exhibition, featuring a large number of objects on loan from a local private collection. This particular collection strongly emphasizes the Western Subarctic culture area of North America, and Northern Athapaskan material culture in particular. University representatives put me in contact with the anonymous collectors who generously allowed me access to the bulk of their collection including a large quantity of Athapaskan textiles and utensils.

Sam Noble Oklahoma Museum of Natural History (SNO)

On February 25th 2010, I visited the natural history museum on the Campus of the University of Oklahoma, Norman. The museum holds about two dozen American Indian bows, many from the Great Plains, and including at least two Apache bows. I anticipated that some of these weapons would be sinew-backed, but upon arrival it turned out that they are all self bows, many being apparent "tourist" items made in the twentieth-century. I documented the most relevant self-bow specimens for my database. This museum has a significant quantity of footgear and basketry from the Plains and Southwest.

Gilcrease Museum of the Americas (GMA)

I visited Gilcrease, the art and history museum affiliated with the University of Tulsa, on February 26th 2010. This museum has dozens of Native American bows from all over the country, and very fine and old sinew-backed bows from the Southwest, Plains and Arctic are prominent among them. I documented more than two dozen bows, which were as many bows as I could in the short time I had available (I drove from Norman to Tulsa on the same day). The lack of computerized database access prevented a thorough inventory of Gilcrease materials; each item's provenance had to

be looked up in an old card catalog. At the end of the trip, I believe I documented virtually all of the normal glue type sinew-backed bows that the museum contains, but I was unable to view any horn-bows or compound bows (which were stored in a different room), or to view the entire extent of their collection. I looked at most (if not all) of the Arctic materials, and measured most of them, but was unable to obtain complete measurements for every Arctic bow due to time constraints. Without a digital database system, accurate assessment of the scope of the collection is currently impossible.

National Museum of the American Indian (NMAI)

On April 8th and 9th 2010, I visited the collections of the Smithsonian Institution's flagship museum for North American ethnology, in storage at the Cultural Resources Support Center in Suitland, Maryland. Two months advance notice is required for visits to this facility, and this was the first collection I visited where the volume of material is so massive as to preclude a thorough examination of all relevant materials; unfortunately, I was not able to see everything I wanted to see there. I had to prioritize, first examining Athapaskan and Alaskan sinew-backed bows, with the intention of getting to Plains and Great Basin materials later, time permitting.

I did not accurately estimate the amount of work I need to do in order to document this collection, and I had curators pull more items from the shelves than I could handle in the allotted time. Smithsonian security protocols are time consuming; entrance and exit procedures at the facility are slow, and the lunch break is mandatory, meaning that the actual workday is between six and seven hours. Work was also slowed somewhat by my unbridled awe of the stupendous collection—the temptation to 'talk shop' and peruse the copious shelves with the very knowledgeable staff was ever present.

As the 'final straw', I was forced to spend about half of the second day on lockdown in the basement bomb shelter when several armed fugitives evading police pursuit fled their captors into the facility's campus, where they remained at large for several hours (Basch 2010). The final tally of bows fully documented at NMAI was only thirty-seven, mostly Apache and Eskimo weapons—far fewer than I hoped for this important trip and a non-representative sample of the Museum's bow collections. A dozen or so additional weapons were noted and/or photographed but not fully documented. If I had it to do over again (with advanced notice of the unplanned work stoppage), I would have prioritized documentation differently so as to include a handful of items with better-known provenances that I was unable to include, at the expense of some other items which I did record for which provenances are somewhat vague. Another trip in the future is merited, but requires several months advance notice. I was unable to schedule an additional visit during the 2010-11 academic year.

American Museum of Natural History (AMNH)

I visited the American Museum of Natural History in New York on April 22nd 2010, and I succeeded in documenting most of the available glue-type sinew-backed bows in their collection, including a large number of important Apache weapons. I fully documented thirty-six weapons, or nearly as many in just one day in New York as I did in two days in Washington D.C. The Apache bows were notable for having among the most detailed and diverse provenances possible, often noting the specific Apache tribe of origin including rare examples of documented Mescalero and Plains Apache sinew-backed bows. Also, this collection has (to my knowledge) the world's only surviving examples of glue-type sinew backed bows from inland British Columbia, collected from the Thompson Salish (and/or their Nicola Athapaskan allies) by James Teit in 1897, and

documented in the *Memoirs* of the museum (Teit 1900:239-241). Many objects in the museum were collected by reputable turn-of-the-century ethnographers like James Teit and Pliny Earle Goddard; hence their firm documentation.

The only minor disappointment at this museum is that some of the very finest weapons are on permanent exhibit, and are unavailable for even basic of measurements. In this category are at least two rare Canadian sinew-backed bows, one published by Teit from the Thompson, and another being a rare and unpublished Blackfeet (Blood band) snakeskin-covered bow, AMNH 50.1/1241A, similar to the type in vogue among Athapaskans to the west. And I unfortunately did not have the time to fully document all of the Northern Athapaskan self-bows, such as the one published by Goddard (1916:219). Assistant Curators Laila Williamson and Elise Alexander were especially helpful in emailing me thorough measurements for another Blackfeet bow which was not made available to me at the time of my visit.

Peabody Museum of Natural History-Yale (YPM)

On April 23rd 2010, I visited another particularly rich collection, this one in the Natural History museum of Yale's New Haven Connecticut campus. The building is a very old one, with inadequate storage facilities, meaning that the objects are spread around somewhat haphazardly in different locations on the premise, with some bows stored in a different building and therefore inaccessible. I did my best to document as many bows as possible in the time allotted, given that retrieving items from the complicated multi-floor storage system was a time-consuming task in and of itself. The nineteen bows I did get to examine included most (if not all) of the glue-type sinew-backed bows in the collection which were not on permanent display or housed in another building.

Founded in 1866, Yale's museum is one of the oldest museums of its kind in the world, meaning that this collection includes some very old specimens whose provenances are quite murky due to their collection by amateurs in the era before scientific ethnography was the norm. Several alleged provenances required correction or amendment based on comparative analysis, due to blatant inaccuracy. I did also examine a handful of Yale's Arctic weapons, but I was unable to be more thorough under the circumstances. I am especially indebted to collections manager Roger Colten for subsequently taking photographs for me of a rare Northern Athapaskan sinew backed bow, YPM 15844, which was in a different storage facility at the time of my visit. Detailed measurements for this weapon were provided by its original collector, noted Athapaskanist Cornelius Osgood (Osgood 1937:87).

Field Museum of Natural History (FMNH)

On May 24th and 25th 2010, in Chicago, I visited another one of this country's premier natural history museums (incorporated 1893) and documented thirty-seven bows, many of them collected before 1910. The Field Museum sample is fairly evenly distributed between California bows and Southwest bows, with a good number of Plains and Great Basin bows in addition. The Plains bows included most notably a fine Blackfeet (Blood band) snakeskin-type weapon, FMNH 51662, from southwest Alberta, similar to the weapon on permanent display at AMNH which I was unable to measure or examine. This weapon was published by Allely and Hamm (2002:138). This collection also includes seven Northern Athapaskan self-bows (Deg Hit'an and Southern Tutchone), four of which were published by VanStone (1996:27-29). In the time available, I also documented a few particularly interesting Arctic weapons, but I suspect

there are quite a few more. I am not sure even that I exhausted the collection of glue-type bows, since there is no publically accessible online collection database.

Milwaukee Public Museum (MPM)

On May 26th 2010, I visited another major early North American museum (chartered 1882). The collection here is most similar to the one at Yale in many respects, as the museum is of a similar age and the collection was assembled very early on by non-anthropologists. Hence a number of the provenances are vague and sketchy, though many of the bows are among the oldest I have seen. Here I was able to document everything to the best of my ability, except for a number of Southwestern bows on permanent display. Collections manager Dawn Scher Thomae sought to arrange the measurement for me of these items at a later date, but a museum visitor has since tampered with one of the display case locks, rendering it inaccessible for the time being. The fifteen bows I recorded in this collection include a roughly even distribution of bows from Southwest, Plains, Great Basin, and slightly more from the Arctic. Three of the Arctic bows are compound bows (two of which are made entirely of horn and/or ivory), and one (MPM 576, from Alaska) is very similar in most respects to the Dena'ina Athapaskan bow YPM 15844 collected by Osgood (Osgood 1937:86-87). On this visit I also had the rare privilege of meeting and having a substantive conversation with Curator Emeritus, Dr. Nancy O. Lurie, a close colleague of June Helm and one of the first ethnographers of the Dogrib Athapaskans (Helm and Lurie 1961).

San Diego Museum of Man (JES or SDM)

On August 10th and 11th 2010 I visited the Jessop Weapons Collection in San Diego California, a very important and early archery collection with particularly good coverage of western Native Americans. Joseph Jessop amassed a global archery

collection between 1881 and 1911, and loaned it to the newly formed museum after 1915; his family formally donated the entire collection to the museum in 1974. A few bows came from donors other than Jessop (which I differentiate using the "SDM" code) The collection contains at least one rare Dena'ina Athapaskan sinew-backed bow from Iliamna, Alaska, JES 2691, and at least one additional rare Northern Na-Dene complex bow, JES 2687 (most likely Athapaskan or Eyak) from southeast Alaska or Yukon Territory, and another bow from the Kenai Peninsula, JES 2681, which could be either Koniag Eskimo or Dena'ina. To my knowledge, this makes the Jessop Collection the only archery collection in the United States (with the possible exception of the Smithsonian Institution) to possess more than one Northern Na-Dene complex bow. The global scope of the Jessop archery collection makes it an ideal dataset to interrogate regarding the diffusion of archery technology from Asia to the New World, and it has been put to such use in the past (Rogers 1940).

Travel time substantially abbreviated one of my workdays, but I was still able to fully document 39 weapons, including most (if not all) of the North American glue-type weapons. I was merely able to document a portion of the collection of Arctic glueless-type complex bows. In selecting which Arctic specimens to prioritize for documentation (at this and other similar museums), I have strongly favored Western Eskimo weapons, because they are more likely to have close Athapaskan analogs by virtue of historical proximity; high Arctic bows are much more morphologically derived and isolated from so-called 'Indian' counterparts.

It is once again difficult to be certain of the exact coverage of this collection, because the storage facilities at SDM are antiquated and somewhat haphazard, and the

electronic database is sorely in need of an upgrade. One major concern for this museum is a severe mold problem in their dank and antiquated wooden basement shelving system. A substantial portion of this incredibly important collection (including a sizable portion of the bows I personally examined) suffers from severe grey-green mold infestation. Extreme conservation measures are advisable in the immediate future, to prevent catastrophic loss of invaluable cultural heritage. The best first step in this regard would be to move the bows to another storage facility, but budgetary constraints might be preventing this necessary step. I recommend the museum seek advice from other institutions with similar archer collections, particularly the Grayson Collection at the University of Missouri.

Phoebe A. Hearst Museum of Anthropology (PAH)

On August 12th and 13th 2010, I visited the Hearst Museum (formerly the Lowie Museum) on the University of California, Berkeley campus. Travel time by train from San Diego meant that my work began on the afternoon of the 12th. I was able to document thirty-five bows in one and a half days, including all of the glue-type weapons and some of the glueless Arctic weapons; most important of the latter category is another one of the extremely rare Dena'ina Athapaskan complex bows, this one from Kenai. Unsurprisingly, this was by far the richest collection I examined for bows made by Pacific Coast Athapaskans and their immediate neighbors. This collection also houses a large number of Northern Athapaskan self-bows, but time did not permit me to examine them. An informative study of this Berkeley collection of Athapaskan self-bows is made by Benson (1975). Except for the one bow on permanent display, I had the privilege of examining all the remaining sinew-backed bows made by Ishi (b.1860? - d.1916), the famous Yahi Indian who resided on the museum premise before his death

(when the museum was located in San Francisco); the manufacture of these weapons is described in detail by Saxton Pope (1918).

I also had the distinct privilege of meeting and extensively conversing at work and over lunch with the museum's Tribal Liaison, Bradley Marshall, a traditional Hupa craftsperson with intimate personal knowledge of traditional Pacific Coast Athapaskan material culture. He downplayed the achievements of Hupa (Athapaskan) bowyers, stating that the best bowyers were those of the neighboring (Algic) Yurok; this opinion is echoed by the narrator of a classic U.C. Berkeley-produced ethnographic film which shows the Yurok elder Homer Cooper making a traditional Hupa-Yurok-style sinew backed bow and arrows using all pre-contact era tools and materials (Smith and Barrett 1961). This fascinating film is available on DVD for purchase through the museum gift shop.

Mr. Marshall also drew my attention to a turn-of-the-century mail-order catalog from a California curio shop employing Hupa and Yurok (then called "Klamath") craftspeople to manufacture traditional crafts for sale to customers around the country. A finely painted sinew-backed bow and a dozen arrows could be ordered from the Hupa Reservation for $3.50 C.O.D., including shipping (Brizard 1903:13; see Figure 4-6). One bow in the Hearst collection is apparently such a bow, PAH 1/20812, for which the Museum catalog says the bow was "made to order [prior to 1916] for the nephew of E.L. McLeod." By executive order in 1891, the Hupa reservation was merged with the Yurok reservation, and they were collectively known as the Hoopa Valley Reservation (Huntsinger and McCaffrey 1995: 167). Marshall wisely cautioned me to the fact that 'Hupa' bows in various museum collections purchased from the Hupa Reservation

during this period could have easily been Yurok bows, misattributed by their new owners on the basis of the reservation's 'Hoopa' name.

Museums Not Visited

I will mention in passing two major museums that I was lamentably unable to access due to budgetary and time constraints; the University of Pennsylvania Museum of Archaeology and Anthropology (Philadelphia, Pennsylvania), and the Arizona State Museum (Tucson, Arizona), neither of which has online database access at the present time. The following five museums I did not physically visit, but was still able to acquire valuable data from each remotely, either through publically accessible online databases, or via correspondence with helpful staff members.

University of Missouri, Museum of Anthropology (MAC)

The Grayson Archery Collection at the University of Missouri, Columbia, is one of the more important collections that I have not yet had the opportunity to visit personally. Collected over a lifetime by Dr. Charles E. Grayson (b. 1910-d. 2009), this is one of the largest collections of its kind in the world, rivaling the Jessop Collection in San Diego in both size and scope. Grayson began donating his massive and comprehensive collection to the museum in the early 1990s (Grayson et al. 2007:xii-xiii). Many of the North American bows in this collection are cataloged in a freely accessible online database, where better-than-average measurements are included with low resolution photographs. This allowed me to remotely expand my own database somewhat, for particular metric variables, although the Grayson database is not complete enough for the purposes of this study to adopt the data en masse. I treat it primarily as a repository for comparative reference matter, with which I can use to help refine my assessment of my own data.

National Museum of Natural History, (NMNH)

The main branch of the Smithsonian has an extensive collection of sinew-backed bows, most which are cataloged online as part of the main ethnological collection, but only rarely with photographs or rudimentary measurements, and often with rather sparse descriptions and identifications. If I return to NMAI to examine more of that collection, it would be worthwhile to visit the NMNH collections as well, as they both occupy the same campus in Maryland. Thanks to the assistance of collections manager Felicia Pickering and contractor Michael Frank, I was able to obtain a complete set of measurements of a Yukon River Athapaskan boys' miniature complex bow, NMNH E5588-0, collected on William H. Dall's expedition on the Yukon River on behalf of the Western Union Telegraph Company in 1867.

Based on the catalog information, this bow could be Deg Hit'an, Koyukon, or Gwich'in, but I strongly suspect it must be Deg Hit'an by reference to Dall's own account of the expedition. Dall describes his habit of bartering with Deg Hit'an child-archers for their small quarry (mice and small birds), and notes that the advent of firearms had rendered adult-sized bows obsolete among the Athapaskans. Although there was a single Koyukon shaman in their party, there were no children mentioned other than those of the Deg Hit'an. The Gwich'in of Fort Yukon (allies of the Canadians) were only mentioned as being hostile to the Deg Hit'an (Dall 1897:67, 143). This Yukon Athapaskan boy's bow is the only complex bow of certain Northern Athapaskan manufacture in the publically accessible database. Murdoch (1885:315) mentions a rare Tlingit sinew-backed bow from Sitka in the collection, but he does not mention the item number.

Peter the Great Museum of Anthropology and Ethnography (PGM)

This museum collection, located in St. Petersburg Russia, includes two Dena'ina Athapaskan complex bows collected from Kenai in the 1840s (when Alaska was still Russian), PGM 2667-17 and PGM 2667-20. These bows are photographed (but not measured) in Osgood (1937:228). Thanks to Yuri Berezkin (Chair of American Ethnology), I was able to obtain photographs and a partial set of measurements. One of these bows is very similar to, PAH 2/6361, also from Kenai.

Royal British Columbia Museum (RCBM)

I initially planned to visit this collection in Vancouver, British Columbia, because this museum (apparently) possesses two Northern Athapaskan complex bows. However, these bows are both of rather vague provenance (both simply "Athapaskan attributed") and one of these, RCBM 6563, is currently missing, whereabouts unknown. The other bow, RCBM 6571, is on permanent display and inaccessible to visiting researchers. This means that a visit to the collection would not have been worth the great expense. I am nonetheless indebted to Brian Seymour for sending me partial measurements and high-quality photographs of 6571, and the single image and length measure available for missing 6563.

State Hermitage Museum (SHM)

This museum in St. Petersburg, Russia includes at least five bronze or iron daggers of the Tagar culture of southwest Siberia, on the upper Yenisei river, dating from around the mid first millennium BCE (Karasulas 2004:29). This is the probable Dene-Yeniseian urheimat (linguistic homeland). These daggers' relevance to Athapaskan material culture history has been made explicit by Frederica De Laguna (1947:182), who notes their similarity in size, shape and form (including a distinctive

broad double-spiraled pommel) to the annealed native-copper and trade-iron daggers of the Alaskan Athapaskans. I am grateful for the museums permission to reproduce high-quality images from their website.

Bow Morphology, Material Culture, and Athapaskan Migrations

In addition to establishing new qualitative typologies for the rare weapons that do not fit into existing categories, my ultimate goal is to conduct appropriate statistical analyses of morphological variation (such as chi square and multidimensional scaling analysis) in order to quantify the changes in complex bow morphology throughout geographic space. Taken in conjunction with the linguistic and archaeological evidence for Athapaskan strong complex bow use, inferences about the timing and direction of the Athapaskan migrations may be possible.

The complex archery hypothesis for Athapaskan origins is concisely stated by James Downs, in his standard textbook on the Navajo. He suggests that several distinct yet culturally associated Na-Dene languages arrived in a single wave from Asia during the Common Era, in likely response to a period of imperial expansion in northeast Asia.

> What caused the Nadene-speaking people of Asia to migrate into the New World is unknown. This was a period of great turmoil in the Old World. All through Eurasia peoples from the interior seem to have been pushing toward the edges of the landmass. Perhaps this migration to the north and east is somehow related to this general situation. . . . Two material culture items that they may have brought with them are the hard-soled moccasin and the strong, complex bow, both of which appear to have Asian origins (Downs 1972:5-6).

Most of the artifacts I examined directly in my fieldwork were sinew-backed bows (both Athapaskan and non-Athapaskan); I am also interested in a possible Athapaskan vector for the late prehistoric diffusion of leather footgear in western North America.

However my impression (at least initially) was that most of the native footgear in ethnographic collections has been greatly influenced by Euro-American culture from a number of different sources, and was widely diffused through the modern coalescence of pan-Indian Plains culture, not directly attributable to prehistoric causes. I was thus unable to successfully develop a systematic methodology for the analysis of moccasins, and the incorporation of footgear into my study is haphazard.

At the outset of my study, I was reluctant to incorporate projectiles and projectile points into my analysis for several interrelated reasons. First, projectiles are often 'backwards compatible' with bows of different types, and the sinew backed bow (with few exceptions) invariably replaced the self bow as it diffused. In other words, there are many cases where different arrow types are used with similar bows, or where similar arrow types are used with different bows, so there is no straightforward way to use projectile form to infer bow type. Even the difference between arrows versus atlatl darts is in some cases ambiguous (Cattelain 1997; Hare et al. 2004); quantitative distinction between arrowheads and dartpoints is possible, but the separation between the two forms is imperfect (Thomas 1978). Also, most Apache arrows in collections are made with post-contact metal tips, which I initially felt were inappropriate analogs for proto-Athapaskan material culture (Figure 4-8). In other words, I felt that the numerous ambiguities associated with arrows and arrowheads were sufficient to limit their utility for my study. In hindsight, there are areas for investigation which may have been more useful than originally anticipated, and these will be discussed in the analysis section when addressing objects besides bows.

Arrows often both reflect specialized functions, individual style, and broad regional standards (Mason 1894:660). Most Athapaskans are not well known for making lithic arrowpoints. Generic, non-descript side-notched arrowheads are characteristic of many groups in Southern Athapaskan territory (Figure 4-7). Style is less useful a diagnostic feature than material source. Apache arrows often used retouched, recycled prehistoric points or fashion slender blade-like points from scraps of sheet-metal (Ferg and Kessel 1987:50-52). The most common Northern Athapaskan projectile point material is poorly preserved bone or antler, although native copper was also common (Clark 1991:102-103). My initial impression was that metal arrowheads and knives among Athapaskans were a post-contact phenomenon; in hindsight, it would have been interesting to investigate possible morphological continuities or changes between Northern Athapaskan pre-contact copper points and knives, versus Southern Athapaskan post-contact steel points—these issues will be discussed in subsequent chapters. At various stages of my fieldwork I have looked at a haphazard assortment of objects besides bows (such as baskets, footgear, apparel, arrows, knives etc.), and these will be qualitatively incorporated into my analysis. I did not examine ceramics in the field, but they are well represented in the literature and will nonetheless be included in my holistic analysis of Athapaskan material culture. The validity of the complex archery hypothesis for Athapaskan origins can be determined only in the context of Athapaskan material culture in general.

Summary

Chapter 2 reviewed more than 100 years of the cross-disciplinary literature on the Athapaskan expansion, and Chapter 3 critically explored more current literature with an eye toward the revolutionary implications of the Dene-Yeniseian hypothesis in different

subfields of anthropology. Having laid out the basic methods and issues relevant to the study of bows in Chapter 4, Chapter 5 will begin with a detailed description of the materials examined, and will culminate in an extended discussion of the context of strong complex bow use in western North America and in Athapaskan societies in particular.

Table 4-1. Summary of bows studied.

		Complete measurements obtained			Incomplete measurements	
Museums Consulted	Visited?	Complex bows	Simple Bows	Total	Complex bows	Simple bows
AMNH	Y	31	5	36	1	1
FMNH	Y	28	9	37	0	0
GMA	Y	7	2	9	5	0
MPM	Y	13	1	14	2	0
NMAI	Y	35	1	37	2	0
NMNH	N	2	0	2	0	0
PAH	Y	33	2	35	0	0
RBCM	N	0	0	0	2	0
SDM/JES	Y	37	2	42	0	0
SNO	Y	0	3	3	0	0
SHM	N	0	0	0	2	0
YPM	Y	18	1	19	0	0
Misc**	N	4	0	0	0	1
TOTAL	n/a	208	26	234	14	2

**Miscellaneous includes bows (in museums and private collections) not examined firsthand, but whose measurements were obtained from published sources

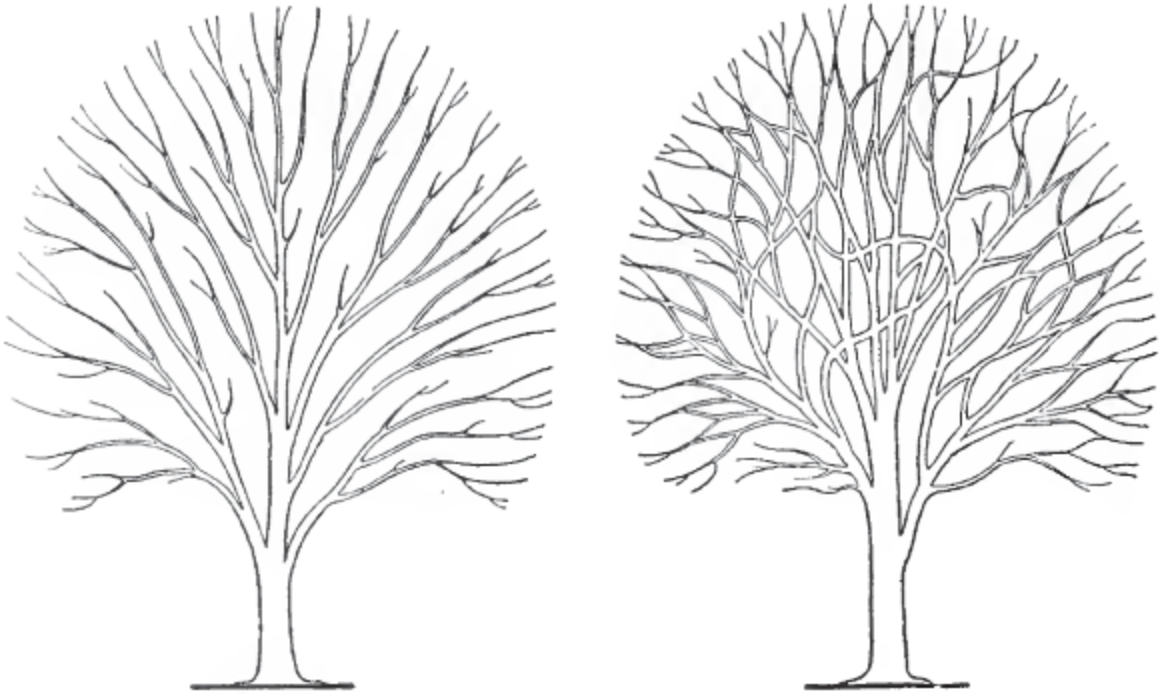


Figure 4-1. The tree of life and the tree of knowledge of good and evil—that is, of human culture (Kroeber 1948:260).

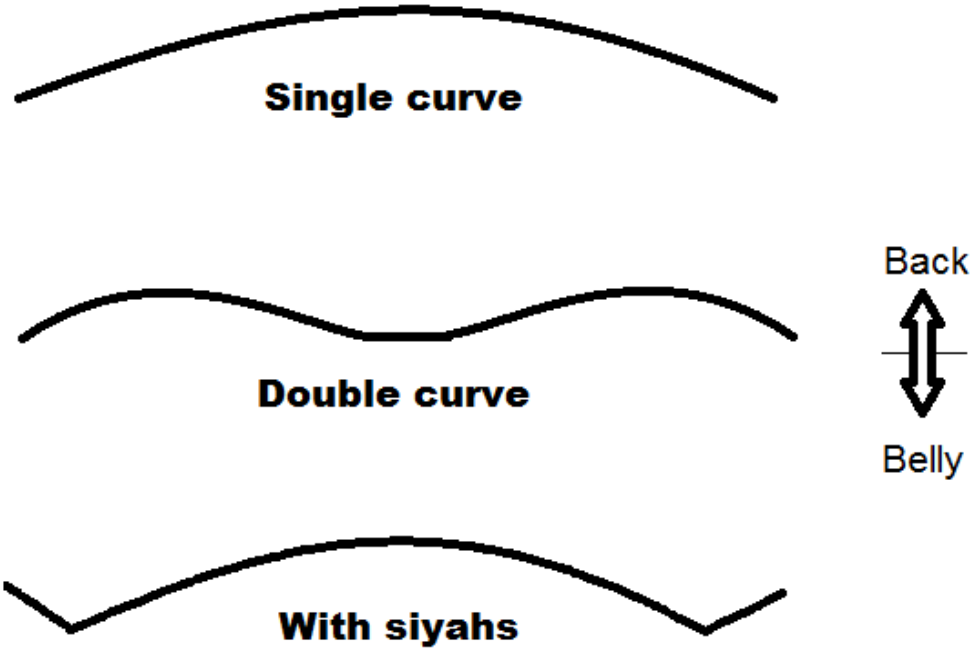


Figure 4-2. Three common sinew-backed bow shapes observed by the author. Crude or improperly-braced bows can be difficult to classify. Bow diagrams appear braced (strung), but at rest; sinew-backed bows are often reflexed (recurved) and would appear to bend 'backwards' when unstrung. Author's sketch.

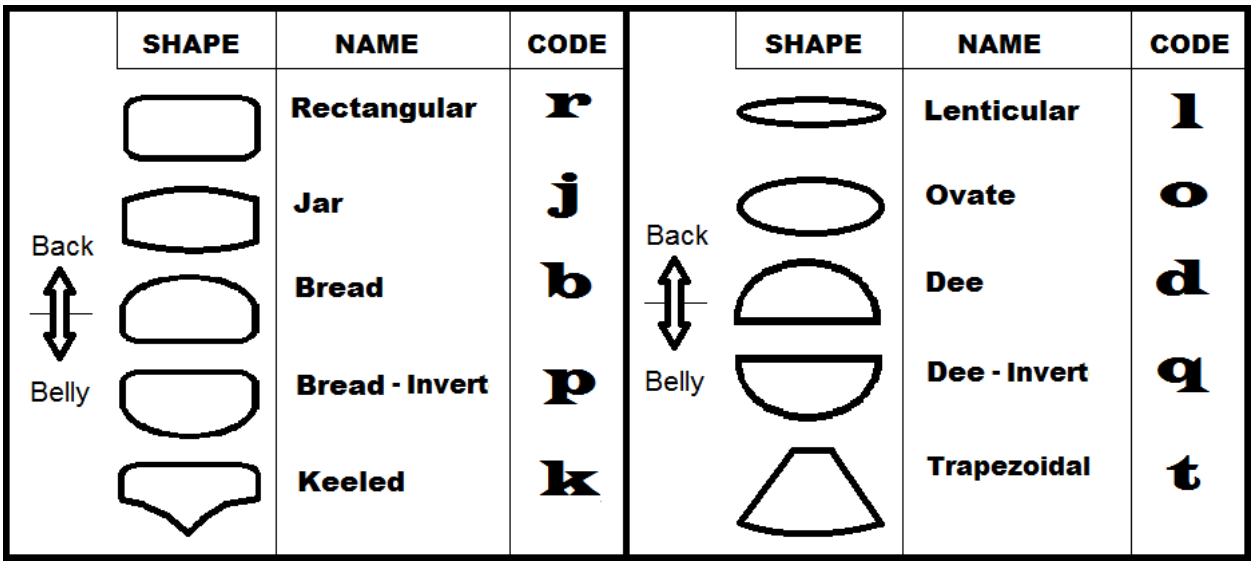


Figure 4-3. Six common cross-sectional shapes of the bow (reckoned transversely). Because there is continuous variation between each shape, intermediate shapes are possible. A single North American bow can have as many as three distinct cross-sectional shapes, as reckoned from the grip, midlimb, or near the tip. Author's sketch.

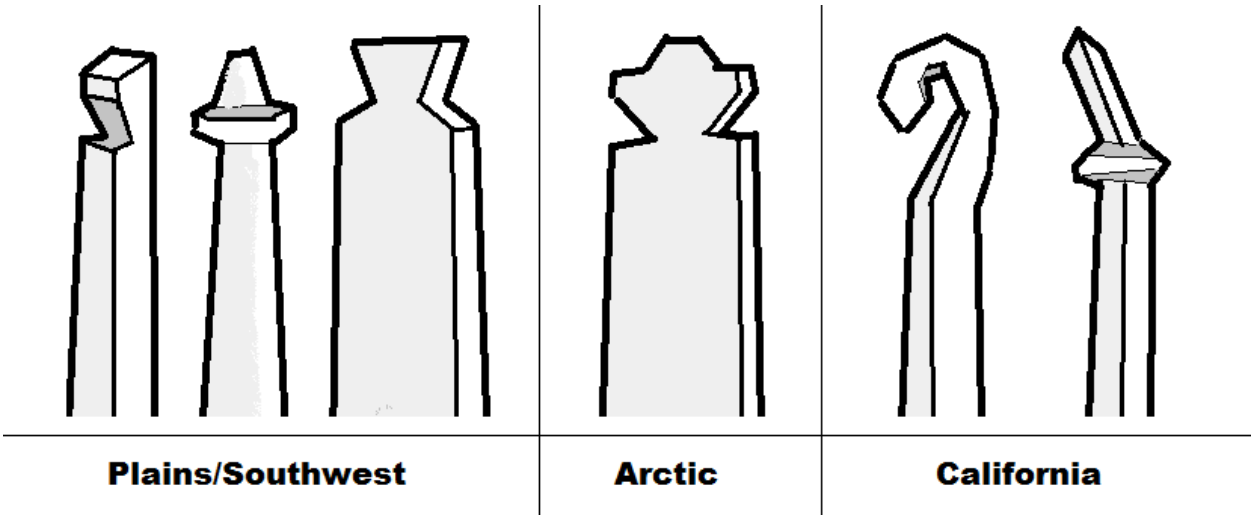


Figure 4-4. Sketches of several different nock-types, grouped by the culture areas where they commonly appear. Backing surface appears shaded. Author's sketch.

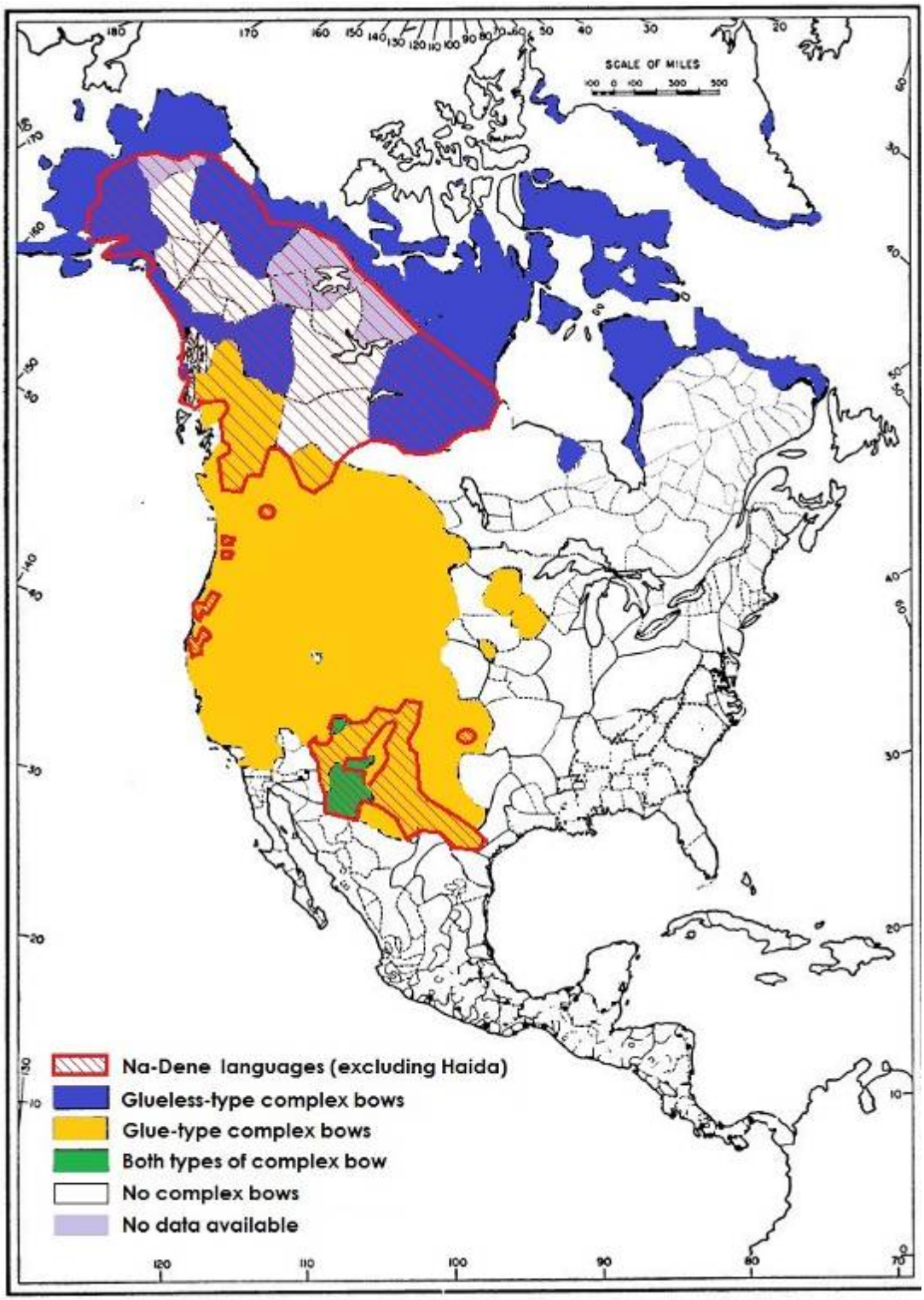


Figure 4-5. Strong complex bows in North America, in comparison to Na-Dene language distribution. Modified from Driver and Massey (1957: Map 138) with reference to the literature (Bird and Bohr 2001; Curtis 1928; Emmons 1911; Teit 1906; Murdoch 1885) and to author's field notes.

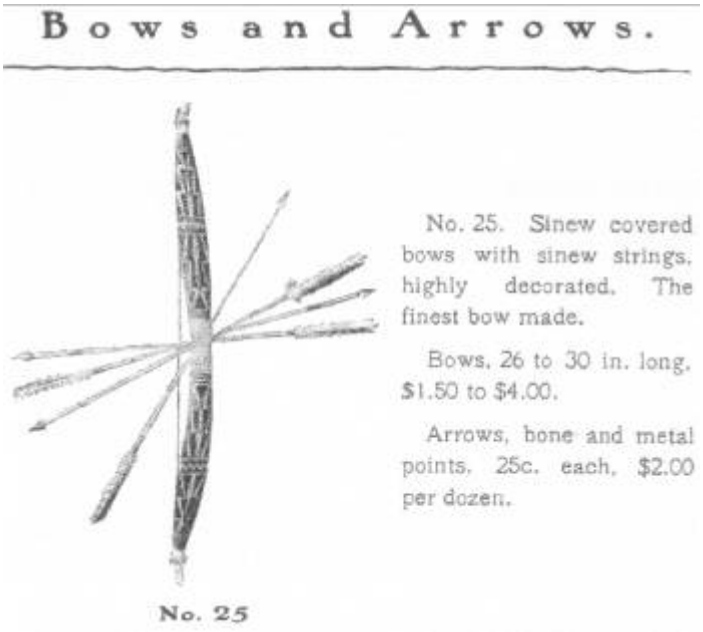


Figure 4-6. Catalog entry for mail-order purchase of Hupa or Yurok bows from the general store of the Hoopa Valley Reservation. Detail from Brizard (1903).

Figure 4-7. WFU 1993.02.E.3. Navajo or Pueblo arrowhead, collected in the 1940s. Approximately 1 inch by 1 inch. Photo by author, courtesy of Wake Forest University Museum of Anthropology.

Figure 4-8. UTK MM.6.B4.B1.1:21G/46. Nineteenth-century metal-tipped Apache arrow (center, foreshaft). Arc-shaped blood/lightning groove is faintly visible on pitch-blackened shaft. Photo by author, courtesy of Frank McClung Museum.

CHAPTER 5
COMPLEX ARCHERY AMONG ATHAPASKANS AND THEIR NEIGHBORS

Overview

In Chapter 4 I explained the method I employed for collecting my data. In this Chapter 5, I will present my findings and discuss their relationship to my original research question. In Chapter 1, I asked: how and why the itinerant Navajo and Apache, originally from the far north, came to demographically overwhelm earlier southwestern Puebloan societies in a relatively short amount of time, despite an extreme difference in cultural ecology between the two regions. Chapter 5 will discuss the likelihood that ethnographic complex bow distributions help to reveal historical patters relevant to the speed and timing of the Athapaskan expansion, and how such an event was possible. A goal will be to document the geographical patterning of Athapaskan complex bow typologies, and to integrate a discussion of these patterns with an analyss of the temporal processes of Athapaskan migrations and to ultimately provide a greater material cultural context for issues raised in the earlier chapters. I am primarily interested in the possible diffusion of the strong complex bow, also known as the 'backed' bow, in the hands of Athapaskan speakers and their neighbors. Simple 'self'-bows are not the main focus of my study, although some were observed and they will be briefly discussed. I have noted that there are approximately equal numbers of Athapaskan-made and non-Athapaskan-made glue-type sinew-backed bows in the collections I have studied, meaning that Athapaskan-made sinew-backed bows are significantly over-represented in proportion to the population of Athapaskan speakers. This might have bearing on the question of whether or not Athapaskan speakers had a particularly significant role in the spread of this technology. If there are any widespread

and characteristically Athapaskan patterns of complex archery technology, such patterns could be corollaries to the migration process.

Constitution of the Dataset

My primary dataset consists of a series of detailed measurements and observations made of 242 bows of aboriginal manufacture. I directly measured 236 of 242 bows (97.5%). I did not measure the remaining six myself. The data for these six bows were obtained, either through published sources (Allely and Hamm 2007; Osgood 1937), or through cooperation with helpful museum staff and other individuals listed in the acknowledgements section (especially Felicia Pickering and her staff at NMNH). My main body of data only includes items where I have obtained a complete set of measurements.

The 242 objects in my primary dataset may be categorized in a number of different ways. The vast majority (240 out of 242) are more-or-less complete specimens, with the remaining two being smaller archaeological fragments of bows (one from San Francisco, California and one from Lovelock Cave, Nevada). Three bows are complete bows from archaeological contexts (in California, Colorado, and Arizona). Only the Lovelock fragment came from a professionally excavated site, and not from a stratified context (Loud and Harrington 1929:vii, 97, 178). The rest of the set (238) are mostly bows from ethnographic collections, with the notable caveat that the provenance for a number of these items is ultimately obscure, as with most of the archaeological bows mentioned above, owing to their collection by a variety of professional and non-professional individuals (many anonymous) over more than 160 years. The presence of bona fide archaeological specimens thus may naturally have escaped attention. In the case of those bows labeled “very old” when originally acquired by ethnographers and

collectors in the last 150 years, they may have originated from subterranean caches accessed by the researchers' indigenous collaborators, and thus the line between archaeological artifact and ethnographic object may be blurred in these cases. Noteworthy are a Hopi horn-bow, FMNH 66383, collected from a ruin in the occupied village of Oraibi in 1899 (or before), and the Dena'ina Athapaskan bow, YPM 15844, collected by Osgood in the early twentieth-century from a collaborator who retrieved it from an old cache (Osgood 1937:86-87). These items clearly occupy the grey area between ethnographic and archaeological collections.

The Reliability of Cultural Identifications in Museum Records

Most of the items in my sample have fairly reliable provenances, or at least as reliable as can be expected for objects collected mostly by non-professionals during the late nineteenth and early twentieth-century. But a significant number of items are only tentatively identified in the catalogs or accessioning books, and thus have questionable origins. Depending on the standards of evidence one adheres to, between about twelve and eighteen (or more) bows in my dataset were at least initially without any firm provenance whatsoever. In cases where a variable degree of certainty exists about an object's origin, I have relied upon morphological similarity with other similar objects to help confirm or refute the speculative provenances in museum records (which I have indicated using question-marks next to corresponding ethnonyms in my spreadsheets). In a number of cases, even the most basic provenance information may be unavailable, and I am left to assign cultural provenance myself based on comparison to similar materials.

Other weapons possessed a particularly dubious provenance, like a Plains/Southwestern-style sinew-backed bow inexplicably attributed to the Florida

Seminole, YPM 30856, a central-California-style sinew-backed bow attributed to Mexico, YPM 15005, or a Northern California style bow attributed to the Arctic, NMAI 25/1667. Likewise, some catch-all regional descriptions may be employed, such as "Plains", "California", or "Arctic". Similarly, a laundry list of multiple cultural affiliations may be employed, such as is the case with the old bow cataloged as "Sioux, Cheyenne, Crow, Blackfeet, Cree or Hidatsa", MPM 3168a. And many of the Sioux and Cheyenne sinew-backed bows I have measured are extremely difficult to distinguish from Apachean bows (unlike other groups); this similarity is such that bows lacking firm provenance are often impossible to place with certainty on typological grounds into the either the Southwest or Plains category, and may be labeled "Sioux OR Apache", "Navajo OR Plains", etc. Such ambiguous weapons include MAC 1995-0661, MAC 1995-0027A, and YPM 10763. (For a summary of items with corrected provenance information, see Table 5-1 and Table 5-2).

Fine-grained measurements permit a framework for the comparison of poorly identified materials with those whose provenances are well-established. This has the advantage of strengthening my dataset and increasing the value of the collections studied for all concerned (museum professionals, the interested public, and the Native Americans whose cultural heritage these objects represent). In addition to the complex bows which constitute the primary focus of my fieldwork, I was also able to correct errant cataloging information for other items of Native American cultural patrimony as well, particularly splint basketry from the Northwest Coast. I identified two such plaited splint baskets , WFU 1984.E.0437, and WFU 1984.E.0668, which were arbitrarily attributed to Subarctic Athapaskans (sometime after they were accessioned) on the

basis of a generally credible Western Canadian provenance. But this type of basketry is relatively rare in the region, and the only Western Canadian natives definitively known to make plaited splint baskets are Coast Salishan and Wakashan peoples (Goggin 1949:166). Others may have made them as well, so an Athapaskan provenance is not unfathomable. But it is unreasonable simply to guess at Athapaskan identification on the basis of current evidence. This speculation was presumably made because most of Western Canada is Athapaskan territory, despite the fact that Athapaskans reside in the interior while the most prolific basketry producers reside on the coast. Further corroboration of a likely Salishan provenance for these putatively Athapaskan baskets is made through comparison to similar Salish cedar splint baskets in the Pearsall collection at the University of Florida (Table 5-1 and 5-2).

Basic Typological Divisions of the Dataset

Basic typological divisions of the dataset are fairly straightforward. A total of 213 of the bows I have classified as 'complex' (or 'backed-'), and 29 as 'simple' (or 'self-') bows. See Figure 4-5 for a pre-contact depiction of the approximate geographic distribution of the two major complex bow types in North America. The complex bows can be divided into several categories, not all of which are mutually exclusive. The vast majority of the complex-bows are backed with sinew, but at least eight of them of them are backed with non-standard materials. Six are backed with hide (or generically 'babiche', which is a term that may refer to gut or hide). These six babiche-backed bows are exclusively from the Arctic and Subarctic, including two Athapaskan bows and four Eskimo bows (two from Alaska and two from Siberia). One additional bow (probably Tlingit, attributed to the Northwest Coast) is backed with white plant-fiber

cordage (presumably cotton, acquired though trade). These seven bows are of the 'glueless' or cable-backed type.

Formerly, among the Tahltan Athapaskans of the Western Canadian Subarctic, the 'glue' or 'lined' variety of backed-bow was also known to occasionally include hide in lieu of sinew for the longitudinally applied reinforcement backing; these glue-type hide-backed bows were not collected by the early missionaries and ethnographers who observed them (Emmons 1911:65-66). Two short glue-type sinew-backed bows in the dataset, from Western Canada, have snakeskin over the backing, but this skin is found in addition to the normal sinew (as a waterproofing agent) rather than in lieu of sinew as in the Tahltan case. Another bow, AMNH 16/1071, is entirely encased in a glued-on sheath of cherry bark, wrapped in a transverse spiral from tip to tip, without any apparent sinew layer underneath. By increasing the bow's elasticity, the bird-cherry-bark wrapping is a functional (though less effective) substitute for a sinew back. Bows of this type were used in the Nicola Valley of British Columbia, by the local Athapaskans and Inland Salish speakers (Teit 1900:239-241).

Unfinished and Fragmentary Bows

Four bows in the sample are unfinished, technically just staves in preparation, prior to the application of the sinew backing (two Jicarilla Apache, one Hupa and one Blackfeet). All four of these staves have various clear diagnostic features of sinew-backed bows, indicating they are not simply self-bows, but would-be backed-bows prior to the application of backing; thus they may be included without hesitation in the relevant subsets of the data with finished bows of the same type. One of the archaeological bow-fragments, PAH 1/174972, lacks any obvious sinew back, but has surface characteristics suggesting the presence of an adhesive residue and a

somewhat coarse back (in contrast to a polished belly) suggesting a sinew backing originally was attached to this weapon, lost through decay. This weapon, consisting of most of one bowlimb, is also morphologically consistent with Miwok and/or Wintu sinew-backed bows from the same region, so it can be justifiably pooled with these similar sinew-backed weapons for my analysis (Figure 5-2).

Complex Bows versus Self Bows

Including the four unfinished and two fragmentary weapons along with complete weapons in this category, there are 170 glue-type sinew-backed bows in addition to the single glue-type bark-wrapped weapon from British Columbia already mentioned, making 171 glue-type complex weapons total. A total of 41 bows are 'glueless' cable-backed bows of various types, and of these 40 are from either Canada, Alaska, or Siberia, while just one cable-backed weapon is from any of the coterminous forty-eight United States (in this case, Arizona), a likely Apachean cave-bow. A similar situation obtains for the presence of glue-type weapons in the north; there are four glue-type complex bows which are demonstrably Canadian in provenance; (three sinew-backed, one bark-wrapped), one Blood (Blackfeet) weapon from Alberta, and three Thompson/Nicola weapons from British Columbia. The rest of the glue-type weapons are from the Western half of the lower forty-eight United States.

My initial plan in undertaking collections research for this study was to compare specifically Athapaskan glue-type sinew-backed bows from British Columbia and Alberta to those made by Southern and Pacific Coast Athapaskans. There are abundant references to Canadian Athapaskan glue-type complex bows in the early anthropological literature. Morice (1894:53-59), Ray (1942:148-149), and McClellan and Denniston (1981:378) record them for the Chilcotin, Carrier, Babine, Sekani and

Tsetsaut. Teit (1900:239-241) records them for the Nicola. Emmons (1911:65-66) and Teit (1906:343) record them for the Tahltan, and Curtis (1928:99) records them for the Tsuut'ina. The Canadian Cordilleran peoples (probably Sekani) were so closely associated with sinew-reinforced bows that they were christened "Strong Bow Indians" on Peter Pond's 1785 map of native Canadian groups (Gillespie 1975:376; Ives 2003:258) (Figure 5-2).

I originally thought that such weapons had been collected by the ethnographers who described them, but it appears they were not. If any such weapons survive, I have not personally found them, nor have I found an authority who knows of their existence. The closest examples are those similar snakeskin-covered sinew-backed weapons from British Columbia and Alberta (Thompson-Salish and Blood-Blackfeet) which are geographically directly peripheral to the Chilcotin/Nicola and Tsuut'ina peoples respectively, AMNH 50.1/1241A, AMNH 16/1341, and FMNH 51662. Typical Chilcotin and Tsuut'ina sinew-backed bows also used snakesking waterproofing, and may well resembled these weapons (Curtis 1928: 99; Ray 1942:148).

Horn Bows, Compound Bows, and True Composite Bows

Eight of the weapons in my sample were either horn-bows (utilizing horn or bone instead of wood as the primary stave material) or true compound bows (featuring multiple stave segments of horn, bone or antler and/or wood spliced or laminated together), or both. There is considerable overlap between these categories. Four of these bows were of the glueless-type from Canada and four were of the glue-type from the contiguous US. In the far north the compound/composite bow is closely associated with treeless climes and with the lack of readily available bow-wood. Further south, horn bows and compound bows are associated with the rise of equestrian

transhumance in the northern Plains and Plateau after the eighteenth century. This owes to the advantage an extremely short bow confers upon a mounted archer, similarly to Old World contexts (Hamilton 1970:45, 51). They also have sporadic distribution among more southerly and sedentary peoples (such as Hopi and Kaibab Paiute). The limited distribution of this weapon in regions where horn was plentiful is suggestive of a relatively recent northern origin (Steward 1941:231). Glue-type horn/composite bows have been reported for Athapaskans, such as the Northern Athapaskan Tsuut'ina of the Canadian Plains (Curtis 1928:99).

To my knowledge, the only putatively Athapaskan compound-bow in a museum collection is a glueless-type specimen held in British Columbia, Canada, catalog number RBCM 6563. The catalog suggests this weapon is either Cree or (presumably Chipewyan) Athapaskan. Chipewyan were indeed known to use glueless cable-backed weapons, but compound weapons such as this one were not recorded (Curtis 1928:27). Past use of some form of cable-backed weapon by Western Woods Cree is tentatively suggested in a second-hand account of Cree-elder Louis Bird, who recalls a peculiar type of Cree sinew backed bow (which he did not actually see) described to him by his father (Bird and Bohr 2001:15). Bird does not mention any form of compound (or true-composite) weapon. In contrast, the Eskimo compound bows from north of Chipewyan and Cree territory often employ a more distinctive and complicated 'High Arctic'-style cable-backing method (Murdoch 1885:310-313).

The compound RCBM 6563 might have been collected at a village near Fort Churchill, on Hudson's Bay in northern Manitoba, where Cree and Chipewyan allies were known to congregate with Eskimos. The uncomplicated backing is reminiscent of

southern Alaskan bows, secured by fifteen pairs of half-hitches, with one pair approximately every two inches of length. Most (if not all) of the Northern Athapaskan sinew-backed bows I have measured and documented are similar in this regard. But the compound-nature of the stave is more typically Eskimo; RCBM 6563 has at least four stave segments of horn and wood held together with rivets. RCBM 6563, the one sample of this kind of bow on record, now only exists as a photograph; the specimen in question was lost sometime during the past twenty years (Figure 5-4). The photograph shows mostly the 'belly side of the bow, with only a few inches of the sinew backing visible at one end of the bow. A firm classification of this weapon is unfortunately impossible on the basis of current evidence.

The Old World Origins of the Composite Bow

The oldest example of true composite bows were wooden bows reinforced with bone or antler plates (and presumably backed with sinew), excavated in the mid-twentieth-century from the Sayan uplands of Siberia, in the Altai region west of Lake Baikal (Rausing 1967), (Figure 5-5). This region happens to be the probable Yeniseian language urheimat. These bow parts date to the late Neolithic or Early Bronze age slightly more than 4000 years ago but less than 5000 (Chard 1958:10). The sophisticated recurved composite weapons of later Eurasian steppe empires are careful refinements of the ancient technology of the Altai region.

There has long been a debate about whether the Eskimo-style of glueless cable-backed weapon represents a northeast Siberian antecedent technology, which gave rise to the glued southwest Siberian composite weapon somewhat later on (Balfour 1890). Early anthropologists were convinced that Eskimos and American Indians were descendants of the forebears of all North Eurasians, and their possession of less-

refined complex bows seemed to support this idea, with North American sinew-backed bows allegedly representing the "survival of an early form in the direct line which has led to the perfected Asiatic bows" (Balfour 1890:224). But this cannot be assumed based on archaeological data, as the earliest evidence of pre-Dorset Paleo-Eskimo complex archery (consisting of a few bow bracers) is about 1000 years younger than the Altai specimens, dating from roughly 2900-3900 years ago (Meldgaard 1960:74-75). This early North American complex archery did not survive to late Paleo-Eskimo times but had to be reintroduced from Siberia during the Common Era expansion of Neo-Eskimos (Meldgaard 1962:pl. 5). The sudden American appearance of true composite bows with the arrival of horse culture to the northern Plains and Basin is something of a conundrum, especially considering these bows' striking similarity to the original south Siberian prototypes. This prompted the foremost authority T.M. Hamilton to speculate that they were independently reinvented, on the basis of the fact that there are no archaeological precedents for true composite bows in Pre-Columbian North America. But he nonetheless recognizes the importance of a close comparative study of New World and Old World examples of the weapons.

> [T]he true composite . . . suddenly appeared on the American high plains along with the advent of the horse in the early 18th century. I am not trying to imply that there can be any connection between Baikal bows of around 2500 B.C. and the American horn bows of about A.D. 1700 other than similarity in design. However, I do think that some authority on horn bows should examine the Baikal specimens (Hamilton 1970:45).

American true composite bows (consisting of laminations of horn, wood and sinew) are extremely rare. I examined only one such bow in my study, a Shoshone bow 38 inches long, NMAI 13/1513 (Figure 5-6).

Athapaskan Guard Bows

Eight of the bows in my study have Northern Athapaskan-style attached wrist guards, consisting of a thin trapezoidal wedge a couple of inches long, lashed to the belly of the bow near the grip. Of these eight bows, six are most likely Athapaskan, one is attributed to Eskimo, and one is attributed to Aleut. Two of them (both Athapaskan Dena'ina) are glueless sinew-backed bows, and six are self-bows. An additional sinew-backed Dena'ina bow of this type, PGM 2667-20, is in St. Petersburg, Russia where I was able to obtain some measurements through direct correspondence with the museum (Figure 5-7). The attached-guard bow, despite being popularly emblematic of Athapaskan archery technology, does not encompass the Athapaskan expansion as a whole. The technology is confined mostly to Alaska with limited distribution among Western Canadian Athapaskans, spanning roughly the territory from the Cook Inlet to the Yukon headwaters (McKennan 1959:52).

Four of the guard-bows I examined were from the western extreme of this territory (western Alaska), while four of them were from the eastern extreme (the southeastern Alaskan panhandle and the Yukon Territory). Additional data for the presence of this bow-type in the intervening territory is culled from other sources (Benson 1975). The primary difference between the easternmost and westernmost examples of Athapaskan-style guard-bows is where the hole is drilled in the guard itself; that is where the sinew cords pass through the base of the guard to secure it to the center of the bow stave. There are four bows in the dataset from the upper Yukon; three are from Whitehorse (Yukon Territory) and one is from Haines (Alaska). All four have the hole for the attachment thong drilled through the large face of the trapezoid (longitudinally with respect to the stave). In contrast, the Eskimo, Aleut, and Dena'ina Athapaskan guard

bows from southwestern Alaska all have the hole drilled in the small face of the trapezoid, transversely (laterally) with respect to the stave (Figure 5-8; Appendix A). Northeast Alaska appears to follow the southeast Alaska pattern; the typical Gwich'in guard bows from the PAH collection illustrated by Benson (1975:38), (which I did not measure) also has the hole drilled in the small face; Benson implied that this guard design was typical of all the Gwich'in bows he examined. Likewise this 'western' pattern is evident in the Gwich'in guard bow MAC 1994-0970 (Grayson et al. 2007:167-168).

The Inclusion of Self-Bows in a Study of Complex Bows

Self-bows (as opposed to complex bows) were virtually ubiquitous throughout the Western Hemisphere in pre-contact timeframes; attempts to link their diffusion to particular phyletic expansion events are unlikely to be productive. It is the limited distribution of complex bows among northern and western peoples that makes their distribution potentially illuminating for questions of migration and diffusion.

However, I did examine a number of simple or self-bows as well. In some regions (particularly in the Subarctic homeland of Northern Athapaskan speakers) the extreme rarity of sinew-backed bows may require that self-bows are examined (to some extent) in lieu of the elusive complex ones. While it is often the case that the two types differ markedly, there are other cases where their design features appear to merge (such as in southern Alaska). And a sample of self-bows helps to form a baseline for the difference between the two types (simple vs. complex). I examined a total of 29 self bows. Ten are Northern Athapaskan in origin, and two are Eskimo or Aleut, but of a common Northern Athapaskan type extremely rare among non-Athapaskans. Nine self-bows are Southern Athapaskan (Navajo or Apache). Another five are California bows from the Hupa, Yurok and/or Pomo (representing a common California bowmaking

tradition; see Figure 5-9 for a sinew-backed bow of the same type), and one is a Ute beaded-bow which is apparently also indebted to this tradition. I examined a Comanche self bow with some similarity to Kiowa and Plains-Apache self bows in the literature. Finally, I examined one sinew-reinforced self-bow from a cave in Colorado bearing some resemblance to a similar cave-bow from Arizona (the latter having a sinew back) and to some northern bows and reinforced spears (Hanson 1994:181-182).

Cross-sectional Shape Profiles for Bows

The cross-sectional shape of the bow is an attribute relevant to the spatial patterning of bow morphology and its cultural implications. This is an attribute which most often must be directly observed in person, as it is rarely evident in photographs and not generally included in the text of catalog descriptions. Simple measures of length and width and thickness are more often found in such descriptions, but these dimensions may be practically constrained by the availability of particular bow-woods or use contexts. By contrast, the shape of the cross-section of the bowlimb (and/or grip) appears to vary more an to be more directly linked to variable cultural factors, and it is the feature which appears to most strongly differentiate regional and inter-ethnic bowmaking traditions.

Intermediate Forms

I created a system of classification for describing the variation in cross-sectional bow shape. Figure 3-2 shows the ten most common distinct cross-sectional stave-shapes observed in the dataset. These are coded with the letters B, D, J, K, L, O, P, Q, R and T. Since ambiguous intermediate forms (with attributes of more than one shape are relatively common, occasionally it is necessary to use a ‘hybrid’ classification scheme. A roughly ovate shape (code O) with four flattened, parallel sides like a

rectangle (code R), may also be conceived as a roughly rectangular shape with heavily rounded corners. The subjectivity of arbitrary assignment of an ambiguous to one or the other category could introduce bias to the dataset. It is often true that a shape is much closer to one end of a continuum than another, but for truly intermediate specimens, I would prefer the classification O/R, O/L, etc. signifying that aspects of both shape profiles are present. The order is merely alphabetical, meaning that no priority is implied; it is meant to convey intermediacy.

Many forms can be 'hybrid with 'O' ovate, or 'R' rectangular shapes, and their defining features may be especially subtle. A typical D shape has two surfaces; a flat belly with a smooth, arcing back. A D/O shape is like a D without distinct tips; that is where both surfaces merge roundly at the margins. Another possible 'hybrid' shape form is D/L, 'D-Lenticular,' where an otherwise lenticular shape has one surface bulging outward asymmetrically, to approach a letter-D shape. D/L has sharply defined margins (unlike D/O) but is without the flat face of the D. A typical B shape is like a slice of bread, with three flat sides and one convex arch. A B/R is a shape where the bulge of the arced surface is particularly subtle (approaching rectangular) but still distinctly present. Rarely, one may see a B/D shape, where only one of the parallel sides required for a 'B' designation, or where both parallel sides are short or subtly merge with the arced surface in a D-like fashion. P and Q are the mirrored (inverted) forms of B and D respectively (with the shape of the bow's belly surface substituted for the back). P and Q hybridize with R and O respectively in the same manner as their mirrored counterparts. A hybrid with the mirrored form (B/P or D/Q) is impossible, because one

would not be an ambiguous intermediate form, but a common symmetrical one (D/Q = O; B/P = R or J, 'jarred', flat sides, curved belly and back).

Tri-local Classification System

I have recorded cross-sectional shape at three different locations on the bow stave, beginning with the grip and moving outward along the bowlimb toward the tip. As many as two different shape-codes may apply to any particular cross-sectional measurement. I transcribe cross-sectional shape profiles from left to right in the grip-to-tip direction. A bow with a uniformly D-shaped cross-sectional profile throughout its length would be coded D-D-D. The shape at any one of these three locations can then be straightforwardly compared across multiple bows in a population (or between populations) using normal statistical measures. The influence of ambiguous intermediate shape forms can be accounted for in any bow, by assigning a half-value to each component of an intermediate ('hybrid') shape. So a hypothetical bow with a D-(D/O)-O profile, would contribute one 'D' to the dataset for the grip locus, half a 'D' and half an 'O' to the dataset for the midlimb locus, and one 'O' to the dataset for the tip locus.

Morphological Data for North American Complex Bows

I have grouped several illustrative portions of my dataset into tables based on cultural or geographic attribution (Tables 5-2, 5-3, 5-4 and 5-5). I have elected to reproduce only those variables which are particularly illuminating for subsequent analysis. For the most part, the bows are grouped in tables based on ethnolinguistic affiliation, and there are some clear correlations between ethnicity/language and bow morphology. However, in other cases there have been several linguistically unrelated groups with particularly close historical ties, such as (Athapaskan) Hupa and (Algic)

Yurok in California, whose bows are virtually indistinguishable from each other. Likewise, Plains Siouan and some Plains Algonkian groups (like Arapaho) are especially close historically, and their bow morphology data may be safely pooled into one population system. Blackfeet bows, on the other hand, seem to be more closely related to Plateau bows, with Cheyenne bows difficult to classify (Wissler 1910:160) For some Alaskan bows, a place of origin is all that can be determined with certainty, and so specific bows could be pooled with either Eskimo or Athapaskan populations. Several unprovenanced or misprovenanced bows have been reclassified based on my own comparative analysis (Table 5-1 and 5-2). Where possible, these items are pooled with the data corresponding to the corrected classification.

The Abundance of Athapaskan 'Glue'-Type Complex Bows

The largest portion of my sample was glue-type sinew-backed bows, at 170 bows, and of this sample, 93 (54%) are most likely made by Athapaskan speakers (66 Southern Athapaskan bows and 27 Pacific Coast Athapaskan Bows). At most of the museums where I measured these bows, I made no effort to single out Athapaskan bows in general. I worked my way through all of the glue-type sinew-backed bows I could find, meaning that the ratio of Athapaskan to non-Athapaskan glue-type bows in these institutions, pooled, is approximately mirrored in my dataset.

To my knowledge, at eight of nine institutions where such bows are held (UFL, GMA, AMNH, YPM, FMNH, MPM, SDM and PAH) I examined all of the extant glue-type sinew-backed bows, save for those inaccessible because they were on permanent display or otherwise inaccessibly stored (see List of Abbreviations). The notable exception is one museum, NMAI, where time and circumstances prevented my examination of non-Athapaskan bows; thus NMAI bows are over-represented by

Apachean weapons in the glue-type dataset. A similar situation pertains for glueless (trussed) bows of Eskimo manufacture; because of time constraints in some museums I wasn't able to view Arctic weapons at all. The glue-type portion of the sinew-backed bow dataset, in contrast may be considered roughly representative of the population of glue type bows in these US museums, after correcting for the bias provided by the NMAI portion of the data.

Because I was unable to examine any but a handful of non-Athapaskan glue-type sinew-backed bows at NMAI, my inclusion of the NMAI glue-type bows in the dataset somewhat inflates the proportion of Apachean weapons to glue type weapons in general. To correct for this and get a better sense of the ratio of Athapaskan to non-Athapaskan glue-type sinew-backed bows in American museums, I simply subtracted the eighteen NMAI Athapaskan and four NMAI non-Athapaskan glue-type bows from the pool (also subtracting one Crow and one Apache weapon whose measurements were culled from the literature), I am left with a rough ratio of 74 of 147; almost 50% of glue-type sinew-backed bows in eight American museums are of Athapaskan manufacture. Because ethnological museum displays strive for equal representation of the cultures of interest, permanent museum displays do not accurately reflect the Athapaskan-bias of the collections; I have observed that glue-type bows on permanent display over-represent Non-Athapaskan examples of this technology by about 2:1. There are several possible factors that could help to explain the overrepresentation of Athapaskan bows in collections of glue-type sinew-backed bows in North American Museums.

Demographic Advantage

If Athapaskan speakers in the past held a significant demographic advantage over other tribes, then it is conceivable that their cultural artifacts could be overrepresented in museum collections. The Southern Athapaskans definitely have a demographic advantage over other indigenous linguistic groups today. The United States Census for the year 2000 showed the Navajo is the second largest native ethnic group in the United States, second only to the Cherokee, with about 270,000 Navajos self-identifying as full-bloods, and about 300,000 when 'mixed-race' individuals are included. Apache are the sixth largest indigenous ethnic group in the United States, with between 57,000 and 97,000 individuals depending on whether 'mixed-race' people are counted. The total Native American population of the US in 2000 was 2.5 million or 4.1 million depending on whether 'mixed-race' are counted (Ogunwole 2002:1, 10). Full-blooded Navajos constitute about 10.8% of all full-blooded Native Americans; the population including mixed-race individuals constitutes about 7.3% of the adjusted total. When Apaches are factored in to account for all Southern Athapaskans, these two numbers are about 13.1% and 9.7% respectively.

The number of Athapaskans in the United States in 1894 (based on statistics published by the office of the US Commissioner of Indian Affairs) was 16,102 Navajos, 5,742 Apaches, and about 22,616 Athapaskans total including the addition of less than 1000 Pacific Coast Athapaskans (Morice 1894:16). The 1890s constituted the all-time nadir of the aboriginal American population, with only about 250,000 indiviuals surviving in the US (Thornton 1987:43). It is not clear if this estimate includes Alaska Natives (Alaska was then a US territory), but taken at face value this would mean that the total percentage of Navajos to natives in general was 6.4%, the total percentage of Southern

Athapaskans (including Apaches) was 8.7%, and the total including Pacific Coast Athapaskans was 9%. These numbers are indeed large in comparison with other tribes, but it remains to be seen if they are large enough to account for the radically disproportionate (1:1) contribution of Athapaskan-made sinew-backed bows to non-Athapaskan-made sinew-backed bows in the ethnographic record. The population of Navajos was admittedly relatively high in 1894, but the twentieth-century witnessed a Navajo population boom both in terms of actual numbers and as a proportion of Indians in general.

Furthermore, if demography were the key factor in the equation, then one would expect to see far more Navajo bows than Apache and Pacific Coast Athapaskan bows put together. In reality, there are more than three times as many Apache bows than Navajo bows in the dataset, and about twice as many Pacific Coast Athapaskan bows as Navajo bows, despite the fact that the Pacific Coast Athapaskan population in 1894 was less than 5% of the Navajo population, and the Apache population was barely more than one third of the Navajo. Demographic advantage cannot have been the primary factor at play here.

The Possibility of Deliberate Misidentification

Deliberate misidentification in the nineteenth-century could have skewed the data somewhat. Nineteenth-century curio dealers were liable to want to make a profit in any way they could, and glamorizing the provenance of a bow is one way to make the item worth more. One could speculate that the weapons of infamous Apache resistance fighters may have been coveted by collectors, and so the Apache designation could have found its way onto a number of ‘generic’ Indian bows. In museums, perhaps, this was less likely than in private collections, but many bows in museums originated from

private collections of individuals who acquired their items on the open market during the turn-of-the-century reservation period. Such deception would be more likely (and profitable) for crude self bows lacking diagnostic features and made with haste and efficiency for the tourist trade. Sinew-backed bows, by contrast, were more likely sought by more knowledgeable collectors for whom such bald-faced deception could be a liability.

Also, the inherent value of a sinew-backed bow (a refined weapon requiring painstaking time and skill to make) is relatively high to begin with, and the distinct stylistic features of the bows of different tribes are more obvious to the appraiser. Finally, all the the typological features of Southern and Pacific Coast Athapaskan sinew-backed bows, resepctively are among the most consistent in my dataset, strongly suggesting few if any 'false positives.' If anything, the relative abundance of Apache bows would have facilitated deceptive misidentification of them as other, more highly coveted artifacts. There is some indication this may have taken place. For example there is a bow in the Grayson collection (MAC 1995-0027A) which is in all respects very much like an Apache weapon, but has a nineteenth-century dealer's sticker on it reading "Little Big Horn Battle." The general similarity between bows of the Plains and Southwest is undeniable, but it is hard to gauge the precise cause of this similarity, whether it be trade of bows between groups, horizontal language transmission and pan-ethnic coalescence (or band conversion, e.g. from Apache to Sioux), or antiquities dealer fraud. But if the latter played a role, there is no evidence it could have inflated the ranks of putatively Athapaskan bows so drastically; if anything it could have reduced them somewhat in favor of more rare and unique provenances.

Longer Retention of Traditional Lifestyles

The abandonment of traditional American Indian technologies is closely linked to assimilation and acculturation to Euro-American society; the earlier that contact and assimilation occurred, the earlier the transition to Yankee technological norms (firearms among other things). It is conceivable that much longer Southern and Pacific Athapaskan resistance to assimilation resulted in more retention of traditional arts like bowyery, in contrast to other groups.

> In aboriginal western North America, crafts and technologies associated with women persisted longer in the last-century period of intensive acculturation than did those associated with men. Women continued to practice traditional crafts such as basketry and pottery, and traditional foodways such as seed and root collecting, well into the historic period. Aspects of this culture still survive in some regions. . . . In contrast, the advent first of the fur trade and then of widespread mining and ranching enterprises brought employment opportunities and new technologies, including firearms. . . . In many regions these factors combined to significantly reduce big-game populations. As a result, male-oriented technologies, such as flintworking and archery, and hunting as a regular subsistence pursuit, rapidly declined (Wilke 1988:4).

This situation definitely obtained when nineteenth-century ethnographers first visited the southernmost Canadian Athapaskan groups (Tsuut'ina, Sekani, Chilcotin, etc.); their once-great tradition of complex glue-type sinew backed bowyery was already a lost-art, annihilated several decades earlier by a flash-flood of British and French firearms on the open market. The manufacture of complex bows could then be described in detail only by mature informants (Morice 1894:53-59). The abandonment of bows happened similarly early among Yukon River-dwelling Athapaskans in Alaska and Blackfeet Indians in Alberta; among all of these groups, the firearm quickly replaced the bow and arrow in the second half of the nineteenth-century (Dall 1897:147; Wissler

1910:155-162). This is in stark contrast to the situation with Apache of the Southern Plains during the same era:

> Even in the second half of the nineteenth-century, when firearms were more easily secured than they had been in Spanish times, the basic trusted weapon of the [Lipan Apache] warrior remained his bow and arrow. Lipan poverty was not the only reason for this. A bow and arrow, in comparison with a single-barreled, muzzle-loading rifle, was a very effective weapon when hunting buffalo or when making a charge (Newcomb 1961:117).

Many aspects of traditional Apache and Navajo society endured through the late nineteenth and early twentieth-century; the fact that the nuclei of the richest ethnographic collections were formed during this timeframe cannot be a coincidence; there were active bowyers in the communities when first visited by anthropologists. Likewise, Pacific Coast Athapaskan bowyery was maintained in relative roadless isolation from Euro-American society. At a time when Euro-American migration into northwest California had only recently begun, Brizard (1903:1) wrote "of the complete isolation of the tribes, and the dirth of tourists to the country owing to the distance, expense and hardship of a trip here." Late nineteenth-century Pacific Coast and Southern Athapaskan cultural persistence in the face of American imperialism could account, at least partially, for the overabundance of their bows in ethnographic collections of that era.

The replacement of archery technology with firearms is not, strictly speaking, one of an inferior technology simply subsiding in the face of a superior one. The long retention of technologically superior bows by Apacheans is not an anomaly. As long as traditional Apache archery was a living tradition, it could more than hold its own in the face of the 'sound and fury' of crude muzzle-loading firearms. Lynn White notes:

> The acceptance or rejection of an invention, or the extent to which its implications are realized if it is accepted, depends quite as much upon the

> condition of society, and upon the imagination of its leaders, as upon the nature of the technological item itself (White 1962:28).

Commenting on the replacement of the English longbow by firearms between the fifteenth and sixteenth centuries, Thomas Esper (1965:393) noted "the replacement of the longbow by firearms occurred at a time when the former was still a superior weapon"; it was the decline in the social forces promoting archery as the national pastime that resulted in the decline of archery itself. Once the English no longer practiced the sport religiously, the decline in the penetration power of the bow rapidly followed the decline of ability of individual archers. The anachronistic perception that the bow and arrow is somehow an inferior weapon to early firearms is rooted in the pervasive modern ignorance of good archery practice. The logic holding true for Renaissance Europe also holds true for the late nineteenth-century American West. Crude firearms inexpertly wielded were no match for sophisticated bows, and those cultures where archery practice was strongest (like the Southern Athapaskans) were able to retain their traditional weapons for several decades longer than those for whom the social basis for the maintenance of archery practice was less powerful.

Guns did not replace bows because they were superior weapons. It may be too simple to suggest that guns require less skill to use than bows, but the 'sound and fury' of firearms provide an additional advantage in combat. Furthermore, pointing and shooting a gun may require somewhat less practice and skill than archery. Another factor to consider is equipment cost. The supply of ammunition and gunpowder could be unreliable and variable in proximity to frontier trading posts; this could have been exacerbated for peoples like Apaches with highly mobile lifestyles.

Entrepreneurism or Mercantile Opportunism

Entrepreneurial forces could also be at play in the significant overrepresentation of Athapaskan bows in the sample (nearly one Athapaskan-made weapon for every non-Athapaskan one). Athapaskan mercantile opportunism was responsible for the long history of bowyer's wares being produced for trade between neighboring tribes; this is even evident in oral traditions about early Navajo-Pueblo interactions. In Navajo chantway traditions of the origin times, the Ancestral Navajo traded bows, quivers and buckskin garments for Anasazi (ancestral Pueblo) basketry, pottery, and kitchen utensils (Warburton and Begay 2005:550).

The transfer of this specialists' art to the market of white collectors and museum curators may have been a natural transition during adjustment to reservation life. This is demonstrably the case for Hupa and Yurok bows especially (Brizard 1903:13). The Hupa and Yurok were already the most reputable bowyers in California when they began producing their refined craft in a cash economy. As a result, Pacific Coast Athapaskan style sinew backed bows (including Athapaskan, Yurok and Pomo weapons of the same type) constitute over 75% of my sample of sinew-backed bows from Oregon and California. Entrepreneurism is a likely culprit.

In another example, what was (the last Yahi survivor) Ishi's practice of making bows in his new home (the U.C. anthropology museum) if not 'paying the rent'? There were still Pacific Coast native bowyers proficiently making bows in the Hupa-Yurok style in the late twentieth-century, in marked contrast to the vast majority of tribes for whom this weapon was the norm, but the art is now lost. Similar entrepreneurial forces may have been at play in the Apachean cultural sphere in the late nineteenth-century, although I am much less certain of the specifics of this process in the Southwest.

Discussion of Complex Archery Data

Southern Athapaskan Complex Bows

Opler (1971:83-92) suggested that the Mescalero Apaches were marginal to the Plains cultures, and adopted the practice of making sinew-backed bows from central Plains societies, via Jicarilla Apache intermediaries. My large Apachean bow dataset neither confirms nor refutes this interpretation. One of the two Mescalero bows I saw was similar to Jicarilla bows, while the other was more like Arizona Apache and Navajo bows, suggesting that both areas may have influenced Mescalero bowmaking traditions. In Tables 5-3, 5-4 and 5-5, the morphological consistency of Southern Athapaskan complex bows is demonstrated. Several features are notable. Navajo bows and westerly (non-Jicarilla) Apache bows are remarkably similar to each other, and are rarely painted. They are exclusively painted red when they are painted. They have unusual hide-wrapped grips nearly as often as solid-field sinew-wrapped grips. They often have multiple transverse sinew seizings to help hold the backing in place. They are single curved almost as often as they are double curved only sometimes. Jicarilla Apache bows in particular are very consistent in having a bread-shaped cross-sectional profile throughout, only rarely single curved, and rarely having midlimb transverse seizings. The grip is never hide or cloth, and only very rarely solid-field. Most commonly, the eastern Apachean grip is either multi-banded or barber-pole spiraled sinew (Figure 5-10).

This barber-pole sinew spiral technique, quite common among Southern Athapaskan weapons, has *never* been found on any non-Apachean bow in my database. The only exception is a single Sekani Athapaskan bow from British Columbia identified by Morice (1894:58). This lost Sekani weapon had a similar double-curved

shape with an “almost rectangular” cross-section; “almost rectangular” is an accurate description for both the distinctive B and J cross-section codes which are peculiar (alonst exclusively) to Eastern Apache bows (Figure 5-11). The only major difference from a typical Eastern Apachean bow is the length which longer than almost any bow I saw from any region. There is one notable exception however—an extraordinary 73 inch double-curved Apache bow, JES 858, which is closer to the Sekani bow in many respects (Figure 5-12). These bows, Apache and Sekani, could represent a link between the Apache bowyers and the lost glue-type sinew-backed bow-making tradition of British Columbia.

Another noteworthy fact is the extremely high percentage of Southern Athapaskan sinew-backed bows which have the classic ‘Turkish’ double-curved shape (at least 79%, and at least 88% including Apache only and excluding Navajo). The double curved shape is achieved through reflexing a bow with a strongly-curved grip-area, so that the handle retains the original curve and only the limbs are truly reflexed, into something like a flattened ‘M’ shape (Figure 4-2). When American bows are unbraced, it can be difficult to precisely determine whether they are single- or double-curved, so my estimated frequency of the two main longitudinal shape-classes is imprecise (likely undercounting double curves). Of the twenty-one complete complex weapons made by Numic and Puebloan peoples, I estimated double curvature was present about 50% of the time, similar to the frequency among Navajo bows. To reiterate, this may slightly underestimate the real frequency of occurrence, as unbraced weapons are often ambiguous.

Apache bows are significantly more likely to have double-curved profiles than are non-Apache bows, and these shapes are less ambiguous in nature, that is they are more extremely curved and easier to identify as such regardless of whether the weapon is braced or not. When only eastern Apache bows are considered, the frequency of double curvature is at least 92%, far more often than the occurrence among Non-Apache bows. The double-curved shape is by no means limited either to sinew-backed bows or to Athapaskan bows; the form is widespread throughout the Great Plains (Bergmann et al. 1988:662). But it is not found among peoples unfamiliar with sinew-backed bows. I suspect that the reflexed double-curved form occurs on some self-bows for purely aesthetic reasons, in imitation of (or as a vestige of) the shape of the technologically superior complex-bow. There is no technological advantage to double-recurvature when not otherwise accompanied by sinew-backing (Bergmann et al. 1988:662-667).

The double-curved shape appears limited to glue-type complex bows and (less frequently) self-bows. Glueless cable-backed bows are never double-curved; this is understandable, as the free-floating cable-backing would not easily conform to the double curve shape, and would likely slip and become detached from the bow and cease to function. At least three of the four Canadian glue-type sinew-backed bows I know of (from the Columbia Plateau and northern Plains) are double curved. So are all of the (lost) Northern Athapaskan glue-type sinew-backed bows illustrated by Morice (1894:57-59; see Figure 5-11). The northernmost example of this shape I have seen is an unusual double-curved Northern-Athapaskan attached-guard self-bow from the upper Yukon region, JES 365 (Figure 5-13).

The Spanish chroniclers invariably called Apache recurved complex bows “Turkish bows” because of their strong resemblance to Turkish composite bows (LeBlanc 1999:102). This might not be a coincidence, if the linguistic affinity between the Xiongnu and the (Dene)-Yeniseians bears scrutiny. The so-called “Turkish bow,” a fully developed Eurasian composite bow of the early-Common Era, is actually just the culmination of a millennium of development from late Bronze Age and Iron Age Xiongnu prototype bows, exemplified by those excavated at burials along the Qum-Darya river in the eastern Tarim Basin in East Central Asia. Bows of this type have been spread all over northern Siberia by the Neo-Siberian pastoralist migrants (Rausing 1967:143-144; see also Hall and Farrell 2008). Simpler Hunnic prototypes of the Qum-Darya burials are remarkably similar in shape to Apache bows (and other similar Native American bows), moreso than are any other Old World weapons I am aware of (Figure 5-15). The average length of a Turkish bow is 44-46 inches (Rausing 1967:144). The mean length of my Southern Athapaskan dataset (67 bows) is 43.9 inches, and the median length is 45 inches.

More conclusive proof of the connection between Northern and Southern Athapaskan bowyery is found in a rare trussed glueless-type sinew-backed bow, probably Apache or Western Navajo, from a cave in Northern Arizona, now in a private collection in New Mexico (Figure 5-13, part A). It falls near the median range of Southern Athapaskan bows for all measurements, but has an uncomplicated backing similar to the two Athapaskan sinew-backed bows from the Upper and Lower Yukon River in my database, NMNH E5588-0 (from the Deg Hit’an, see Figure 5-13, part B)

and JES 2687 (from the Alaska Panhandle)—it is also rather similar to Siberian bows JES 2649 and JES 437, suggesting possible continuity with Siberian forebears.

Additionally, the Arizona bow is unusual among cable-backed bows in that it has an ovate cross-section throughout its entire length. In my observations, such an ovate cross-section for a cable-backed weapon is found on only one other specimen; the very small Deg Hit'an Athapaskan boy's bow E5588-0 (Figure 5-13, part B). Hanson (1994:181-182) suggest the Arizona cave bow may be as old as 1150 CE, but this seems extremely implausible based on its excellent condition, one more in keeping with an ethnographic artifact than a weapon alleged to be one of the oldest complete bows in the entire hemisphere. Further 1150 CE is more than 100 years older than the oldest sinew-backed cave bows in the region, according to LeBlanc (1999:103), dating to the late thirteenth century at the earliest. There is no clear indication of how this date was arrived at, but it appears to be a guess. The only Southwestern peoples known with certainty to use such Arctic-type cable-backed bows are Chiricahua and Western Apaches (Gifford 1940:29). Driver and Massey also suggest that westernmost Navajo and some western Pueblo groups used glueless sinew cabled bows as well, but the source of their data is obscure. They comment perceptively:

> The tying on of sinew cords to reinforce the bow, characteristic of the entire Arctic, is also the rule in northeast Siberia. These two areas are actually one, and the sixty mile gap at Bering Straits was negotiated regularly by peoples on both sides. A single origin for the cord reinforced bow is therefore indicated. What about the occurrence of this trait in the southwestern United States? Without the other evidence on bows and arrows this would present a puzzle. However, when we note that two other traits of predominantly northern provenience, the Mediterranean arrow release and tangential arrow feathering, also crop up again in the Southwest, the case for northern origin and southward spread becomes stronger. When we add to this the presence in the Southwest of a number of Athapaskan-speaking peoples, generally believed to have migrated from

> the north, our case becomes still stronger. It looks as if these bow and arrow traits may have been carried southward by migrating Athapaskans (Driver and Massey 1957:355).

If Driver and Massey are correct and the arrival of these bow and arrow traits in the Southwest is attributable to the Southern Athapaskan migration, this raises the possibility that the migrations may have begun later, commenced much faster, and culminated earlier than is generally believed. Archaeological evidence for the spread of complex archery suggests the strong complex bow became firmly established in Southern Alaska quite late in the first millennium of the Common Era, within only a few centuries of its ultimate arrival in Arizona between roughly 1200 and 1450 CE (Dixon et al. 2005; Hare et al. 2004; LeBlanc 1999:103). More work needs to be done to establish the plausibility of such a rapid migration scenario, but the data are suggestive.

The scarcity of sinew-backed bows surviving among southern Canadian Athapaskans means that material for direct comparison of Canadian Athapaskan bows with Southern Athapaskan bows is extremely difficult. There are some analogs between a few of the Canadian *self*-bows I have seen. The Sekani-Beaver-Tsuut'ina family is one which has been plausibly suggested as including collateral relatives of the Southern Athapaskans (Gunnerson and Gunnerson 1971). The handful of Beaver and Tsuut'ina self-bows I have seen appear to have very close analogs with particular Apache weapons. For example, the single Tsuut'ina bow that I know of in a museum collection is AMNH 50/5985B. It has a reasonably close analog in the Oklahoma Apache self bow SNO E/1955/9/21A. Both are thinly-painted roughly-made self-bows with similar dimensions, D-shaped cross-sectional shapes, and single side-notched nock configurations. But really not much can be said about the significance of these

similarities, as similar roughly-made self-bows are found throughout the intervening cultures of the Plains (Allely and Hamm 2002; Wissler 1910).

More significant may be the similarity between one unusual Apache bow, MPM 14748, and typical Subarctic self-bows, including Beaver, Slavey and Deg Hit'an weapons like AMNH 50.1/7664-A (Beaver), AMNH 50.1/7619-A (Slavey), AMNH 50.1/8284 (Slavey), and FMNH 12477 (Deg Hit'an). These five weapons (four Northern Athapaskan and one Apache) are among the most robust I have seen. All are thick and rectangular in cross-section across the entire length, vary between 60 and 67 inches long, and average 1.44 inches wide at the grip. Such massive longbows are normal in the forested Subarctic, but are rather unusual in the desert Southwest. Could this also be an indication of some retained northern self-bowmaking tradition among Southern Athapaskans? Unlike the smaller self-bows mentioned above, these simple longbows are *not* widespread in the intervening space of the Plains, so the anomalous Apache bow stands out among its immediate neighbors (Figure 5-16). But the simplicity of this self-bow means that this suggestion of similarity is also inconclusive; there is not enough design complexity to preclude the possibility of chance resemblance. The similarity is intriguing nonetheless; on first inspection, I would have thought that this robust Apache weapon came from the western Subarctic.

Pacific Coast Athapaskan and Algic Complex Bows

Tables 5-6, 5-7, 5-8 and 5-9 provide summary information for the combined Pacific Coast Athapaskan, Yurok, and Pomo dataset. Table 5-8 shows five fewer bows, because the other tables were expanded slightly (adding three Hupa bows, one Tolowa bow and one Yurok bow) using publically available information from the online database of the Grayson collection (UMO). This database does not include comprehensive

cross-sectional shape data, and so these five bows are left out of Table 5-8. The Hupa-Yurok cultural continuum in northwest California was the traditional center of complex bow manufacture for the entire region, serving very distant peoples by trade. Reservation period oral traditions attributed the most skilled bowyery to the Algic-speaking Yurok (Smith and Barrett 1961). It is possible that Algic and Athapaskan speakers have shared one material culture for a very long time; they may have already been deeply culturally engaged in the Columbia Plateau region (where both ancestral stocks reside) before they arrived together in California during the thirteenth- or fourteenth-centuries. All of these Pacfic Coast weapons (including one Pomo bow) form a single type-class, which is arguably the most distinctive of any geographic or cultural subgroup of glue-type sinew-backed bows I have measured.

I have previously alluded to the Hupa deference to the superiority of Yurok bow-craft (conveyed by Bradley Marshall, also see Smith and Barret 1961). But regardless of the reputed difference in skill, it appears from my data that the Pacific Coast Athapaskans (Hupa plus Oregon Athapaskans) were more prolific bowyers than their Algic-speaking counterparts; Athapaskan-made weapons outnumber Algic-made weapons in these museums by nearly three to one. It is admittedly possible that some Yurok bows have been misidentified as Hupa bows in museum collections because they also came from the “Hoopa” reservation (Brizard 1903). But this cannot explain the noticeably different average bow length and width between the otherwise identical Algic-made and Athapaskan-made bows. The mean measures for length and width appear significantly longer for Yurok weapons than for Athapaskan ones. Bows classified as Yurok are an average of three inches longer and almost half an inch wider than Pacific

Coast Athapaskan bows. Also, PCA bows were slightly more consistent in their cross-sectional profile and nock formation than Yurok bows. Only 'L' and 'D' shapes were observed in the PCA dataset, while unusual 'hybrid' 'L/Q' shapes appeared twice in the much smaller Yurok pool. Hupa nock-design appears more consistently faithful to the 'type', invariably including the distinctive sharply recurved tips, typical for this class of weapons. In contrast, at least three of the Yurok bows adopted a much less distinctive and technologically simpler side-notched nock, lacking the sharp recurvature of the typical bow of this class. But the vast majority of Hupa and Yurok bows are more or less indistinguishable. It is only as populations that they appear to diverge slightly.

Athapaskan-Numic Cultural Reticulation and Complex Archery Diffusion

Most of the vast intervening space between Southern and Pacific Coast Athapsaskan territory is the traditional residence of Numic (Uto-Aztecan) speakers. The Numic expansion is, along with the Athapaskan expansion, one of the two largest North American phyletic expansion events of the mid-Common Era. It is difficult to determine which began first. The Numic spread was south to north, in contrast to the north to south direction of the Athapaskan. But the two expansions were largely coterminous, with multiple temporal and geographic interfaces. Before discussing the Numic data for complex archery distribution, we should be cognizant of Moore's (1994) discussion of ethnogenesis as necessarily involving multiple antecedent societies. The Numic-Athapaskan interface is a relevant case in point. Ambiguity surrounds the identification of early northern Numic versus early Southern Athapaskan cultural remains, including archery artifacts. Most of recorded history has seen varying degrees of mutual hostilities between Southern Athapaskans and various Numic groups (including Utes, Paiutes, Shoshones and Comanches). But there is reason to suspect that very early

Apachean groups included large contingents of bilingual Numic speakers who adopted Apachean lifestyles. The early Southern Athapaskan speakers of the Canadian River (OK, TX, NM), the ancestors of modern Jicarilla and Eastern Navajo peoples, were commonly referred to as “Iyutta-jenne”, a transcription of Ute-Dene, essentially Numic-Athapaskans (Hyde 1959:39, 95).

The DNA evidence suggests that this relationship was primarily one-way; Southern Athapaskans absorbed and assimilated large numbers of individuals from the Great Basin and Southwest, but local Southwestern groups do not show traces of significant DNA admixture with Athapaskans (Malhi et al. 2009:203). This is an understandable result of demographic imbalance of the two founding groups, suggesting that Numic speakers may have already been well established in the region when the Athapaskans arrived. If the hypothetical proto-Apachean founding population was extremely small, and dependent on in-marriage to maintain demic integrity, then genetic drift would tend to erase the signature of out-marriage. But two-way technological exchanges would not be subject to the same constraints. It is possible that the technological impact of the Athapaskans was much greater than the genetic impact.

Tables 5-10 and 5-11 show the length data and cross-sectional shape profiles for the eleven complete Numic complex bows I measured. In stark contrast to the remarkable consistency of the much larger Southern and Pacific Coast Athapaskan data blocs, there is little evidence of overarching typological unity of the Numic dataset. But this lack of consistency can be attributed to the fact that the sample size (11) is too small to facilitatie meaningful interpretation. There is some consistency in Shoshone cross-sectional bow shape (which is often L or Q). The high frequency of the ‘B’ shape

among Ute bows (3 out of 3 Ute midlimbs are 'B' shaped) and the ubiquity of J, B, and R, is most similar to Jicarilla Apache bows, supporting Hyde's (1959:39) assertion that the Utes and early eastern Apaches formed one community in northeast New Mexico and the Texas panhandle. Numic speakers may well have been involved in the spread of complex archery, but Numic involvement in this process must have involved complicated back-and-forth relations with California, Plateau, and/or Plains societies, because the general diffusion gradient of sinew-backed bows was assuredly 'upstream' of the northward thrust of the Numic migration.

Great Basin Archaeological Bow Fragments: Numic or Athapaskan?

Promontory Point, Utah

Archaeological evidence is worth bringing up here. Relatively little evidence of prehistoric sinew-backed bows has been uncovered in the Great Basin. For what has been found, there is some question of which cultures are represented. The earliest examples were the bow fragments excavated by Julian Steward (1937) from a cave-site at Promontory Point, in northern Utah, on the margins of the Great Basin. This site is located in modern Shoshone territory, but the late prehistoric Promontory peoples have very little in common with Shoshone, and much more in common with northern hunting peoples like Athapaskans. The presence in particular at Promontory Cave of northern-style four-piece moccasins, mittens and sinew-backed bows is indicative of cultural ties with Subarctic Canada and/or the Columbia Plateau. Steward writes:

> it is a safe conclusion that the Promontory culture is definitely not Shoshoni as the latter is now understood . . . the impression one gains from studying the material is that the culture is basically one of a northern hunting people . . . This possibility, however, at once suggests that we may have remains left by one of the Athapascan speaking tribes who, during their southward migrations, acquired puebloan traits from the tribes they are presumed to have driven out of the Northern Periphery (Steward 1937:86-87).

Steward's suggestion of the Athapaskan identity of the late prehistoric phase at Promontory was taken seriously and supported by a number of workers through the 1960s, who further connected Promontory (and Athapaskans) with the Fremont culture of the Great Basin, and with the Dismal River culture of the Plains (Aikens 1966; Gunnerson 1956). However, alternative theories of the Southern Athapaskan migration came into vogue in the 1970s, and Steward's theory fell out of favor late in the century. In a typical statement of this view, David R. Wilcox states: "Promontory Point and Fremont are indigenous developments in Utah and that Steward's Promontory Point culture is merely a late regional manifestation of Fremont culture" (Wilcox 1981:217). But more recent work has largely vindicated Steward's early claims of the Athapaskan identity of the Promontory people, particularly through analysis of moccasin design and petroglyphs which suggest strong ties to Subarctic Canada. Ives and Rice note:

> Pictographs at Grotto Canyon in southern Alberta reveal dancers in unequivocally Southwestern styles. The extraordinarily preserved remains of the Promontory Caves, situated near a zone of cultural interaction at the northeastern periphery of the Great Basin, include dozens of soft-soled moccasins made in styles used by northern Athapaskans, as well as unique Subarctic scraping tools (chi-thos) (Ives and Rice 2006:1).

Athropologists have long speculated that Athapaskans may have introduced northern footgear designs to various regions including the Plateau and Southwest (Salwen 1960; Teit 1900:211). Unfortunately Steward's famous Promontory sinew-backed bow fragment (Steward 1937:18) was never dated, was not evidently accessioned by the museum (UMNH), and has since been lost (John Ives, personal communication 27 Aug 2010). Steward's original drawing of the bow fragment is reproduced as Figure 5-17. Another early Promontory Cave bow fragment (UMNH 42Bo1 11602.2) has recently been ^{14}C dated (along with the Canadian-style moccasins

and other organic remains) using accelerator mass spectrometry. The results have not been formally reported yet, but in personal communication John Ives (25 Feb 2011) tells me: “We have about 35 AMS dates for perishables in the caves; with the single exception of a recent Shoshone winnowing basket, the perishables are coming in tightly focused on the AD 13th century.” This would seem to indicate the earliest presence of Athapaskans in the Promontory Caves was about 800 years ago, in perfect agreement with the earliest sinew-backed bow dates in the southwest mentioned by LeBlanc (1999:103), although it is not clear where exactly LeBlanc’s dates come from.

No sinew fibers survive on the specimen UMNH 42Bo1 11602.2, but there are two morphological features which indicate the likelihood that it once had a sinew-backing. In common with ethnographic Shoshone sinew backed bows from the same region, there is evidence of a lateral (transverse) incision in the belly side, less than ten inches from the tip (Figure 5-18). The belly appears to have been thinned toward the grip, below this major incision, but the fragmentary nature of the bow means we cannot say how much thinning was done. Toward the tip, above this major incision, there are numerous minor parallel incisions in the belly surface, lateral (transverse) and perpendicular to the long dimension of the bow. I have only ever seen this treatment on the tips of sinew-backed bows made by Numic speakers. From my observations, I suggest that the tips are left thicker than the adjacent bowlimb to resist breakage under tension, and the bowlimb is thinned to increase flexibility and decrease overall weight. The lateral incisions are in place to help secure the transverse tip seizings. While such transverse sinew bands are present on the tips of some self-bows, none require this deeply textured surface because they are simply present to strengthen the tips. In

contrast, on sinew-backed bows these wrappings are there to secure the sinew-backing itself, under extreme tension and wrapped endwise around the tip, *behind* the lateral banding. This configuration is confirmed when one examines a Shoshone bow with deterioration of the sinew on the tip, revealing the longitudinal backing strips secured by the transverse banding over these parallel lateral incisions (Figure 5-18).

This Promontory bow fragment could be the technological antecedent for this aspect of Shoshone bowmaking, but I would stop short of saying that the Promontory bow *is* a Shoshone bow. It has a very flat belly surface; it simply doesn't look like any of the Shoshone bows I have seen. Four out of five (80%) of the Shoshone bows I measured had deeply rounded belly surfaces (L, Q or J shape), as did seven of eleven, (64%) of the Numic bows. In contrast, at least 81% of the Southern Athapaskan bows in my sample had flat belly surfaces (B, D, or R shape), and those with 'rounded' bellys appear often only very subtly rounded (e.g. 'hybrid' D/L or J/R shapes). In terms of cross-sectional shape, this Promontory bow is more like an Apachean bow than a Shoshone one, while in terms of tip-treatment, it is more like a Shoshone bow than an Apachean one. It is possible that the the Promontory people provided ethnogenetic and technological antecedents to both the Southern Athapaskans and the northernmost Numic peoples, who where not simply ships passing in the night, but 'collaborators' in each others' formative cultural development.

Lovelock Cave, Nevada

Another important Great Basin archaeological site is Lovelock Cave in northwestern Nevada. At the Hearst Museum in Berkeley I observed a small sinew-backed bow tip-fragment from this site (PAH 1/21418; Figure 5-19), with sinew fibers still attached (Loud and Harrington 1929: plate 47). There is no record of an

Athapaskan presence in the region, but Steward (1937:85-86) thought that Lovelock and Promontory peoples could have been harbringers of the same (Athapaskan?) northern hunting culture, indicated by similar hafted knives and similar textiles, including birdskin blankets and matting materials. “Matting from Lovelock Cave, especially of the late period, is much like Promontory matting” (Steward 1937:85). A further link between Lovelock quillwork textiles and similar Northern Athapaskan textiles is highlighted by Galina Dzeniskevich, who further suggests that this quillwork tradition may have been introduced from Siberian reindeer cultures around the middle of the Common Era:

> Noteworthy among the examples of possible early borrowing is the ornamentation of Athapaskan buckskin clothing with split and flattened porcupine quills. That there are common elements in the technique of decorating with reindeer neck hair among the peoples of Siberia and with porcupine quills among the Athapaskans is indisputable. As some researchers have pointed out, such an involved ornamentation technique could hardly have developed independently, and since the reindeer hair ornamentation is probably the more ancient one, the borrowing in this particular instance came from Asia. It is still impossible to ascertain when porcupine quill ornamentation first appeared among the Athapaskan Indians. The only available evidence consists of some fragments of clothing with porcupine quills sewn onto them that were found in Lovelock cave, Nevada, in 1929 (Dzeniskevich 1994:56).

A final element connecting Lovelock peoples with Apaches and Northern Athapaskans is the presence of longitudinally grooved arrowshafts. Called “lightning grooves” or “blood grooves”, these grooves are alleged to allow the blood to run out along the shaft, away from absorbient fur (or clothing), creating a blood trail to assist in tracking the hunter’s (or warrior’s) wounded quarry (Figure 4-8). These grooves are atypical of Great Basin cultures, but typical of Northern and Southern Athapaskan cultures including Sekani Athapaskans and Jicarilla Apaches, and other Plains Indians (Loud and Harrington 1929:97-98; Mason 1907:92; Morice 1894:55).

Northern Paiute oral tradition, as recorded by Sarah Winnemucca Hopkins in 1883, suggests that the late phase of Lovelock Cave culture was occupied by ferocious foreign “barbarians” during the lifetime of Hopkin’s “third or fifth great grandfather” (Hopkins 1883:74). These so-called barbarians were unrivalled archers and warriors who migrated from far away, down the Humboldt River. They were despised by the Paiutes for their alleged cannibalism, and for refusing to adopt Paiute lifestyles. After a three-year war, they were ultimately annihilated when the Paiutes in one evening surreptitiously filled the Lovelock cave entrance with firewood and brush, and set their enemies dwelling ablaze while they slept (Hopkins 1883:73-75).

Could these tales be describing an aborted Athapaskan effort to expand into the western Great Basin? The migration of Athapaskan speakers from the Plateau to the Pacific Coast of Oregon and California similarly may have involved westward progression down various river valleys (Jacobs 1937:61-62). The sinew-backed bow fragment (PAH 1/21418; Figure 5-19) is much too small to be definitively typed, but it shows a D-shaped cross-sectional shape and small size consistent with smaller Pacific Coast Athapaskan complex bows. Yet it is also perfectly consistent with one of the three Paiute bows I have seen. Once again, it proves very difficult to distinguish between Athapaskan and Numic material culture.

Northern Athapaskan Complex Bows

Dena’ina Bows

The number of Northern Athapaskan complex bows in museum collections is relatively few, and all of them are of the glueless type. But it may be possible to draw some conclusions about the spread of the technology from the ones that do exist. An outright majority of the surviving Northern Athapaskan complex bows are Dena’ina in

manufacture—at least five such specimens exist (YPM 15844, JES 2691, PAH 2/6361, PGM 2667-17 and PGM 2667-20). Furthermore, one Alaskan bow of uncertain provenance (MPM 576) closely resembles the Dena'ina bow YPM 15844, and another similar one (JES 2681) is from the Kenai Peninsula and could be either Eskimo or Dena'ina. Denaina have been the principal residents of Kenai in the post-contact era. Although the aboriginal Kenai Eskimo band (known as Unixkugmiut) is thought to have dissolved before the Russian period, later synthetic bands of Chugach and Koniag Eskimos returned to the western tip of the peninsula to trade with the Russians there (Townsend 1979:161). Dena'ina bow YPM 15844 was made using Murdoch's (1885) "southern" style of cable-backing (Osgood 1937:87). But JES 2681 (like most Dena'ina bows) uses the "Kodiak" style of backing. This style-name I have not found in the literature, but only on occasion listed in museum catalogs. Direct observation suggests that the Kodiak style is roughly intermediate between Murdoch's "southern" and "western" styles. The western style is found often in Siberian Yuit bows, and the southern style is found more often on Alaskan Yupik bows (Figure 5-20).

The general opinion of scholars has been that Dena'ina sinew backed bows were borrowed wholesale from their Eskimo neighbors. Osgood believed that the Dena'ina only adopted the sinew-backed bow in the last few centuries:

> That part of the Tanaina area closest to the Kaniagmiut had an obviously Eskimo-like material culture. This is shown by the addition of sea-mammals to the food supply . . . , the use of Eskimo type outer garments, the dance house, the kaiak and umiak, harpoons with floats, the sinew-backed bow, the stone lamp, and the absence of birch bark. These developments probably occurred within the last few hundred years (Osgood 1933:716).

Likewise, Dzeniskevich (1981:124-125) argues that the typical Athapaskan self-bow with attached wrist guard was the original bow used by the Dena'ina, who moved into

their present territory no earlier than the first few centuries of the second millennium CE. Dzeniskevich suggests tha that only with their eventual adaptation to maritime hunting around Cook Inlet (in the last few hundred years) did they adopt the sinew-backed bow from the Eskimos. These attitudes are emblematic of the pervasive anthropological stereotype, which says that Athapaskans are always promiscuous culture-borrowers and Eskimos are the opposite. As Richard K. Nelson put it:

> Eskimos occupying an inland boreal forest environment, maintaining a long history of peaceful contacts with nearby Koyukon Indians, . . . have remained overwhelmingly Eskimo. By contrast, whenever Athapaskans have experienced similar contacts they have tended to lose their identity, not just borrowing but undergoing full-scale acculturation (Nelson 1974:49)

These views are conditioned by the assumption that all of the complex western Alaskan culture traits are essentially (or at least primarily) Eskimo in derivation while the simpler interior culture traits are essentially Athapaskan. But ethnographic reality is not so 'cut and dry.' Joan Townsend is one anthropologist who has strenuously objected to the scholarly imposition of the Eskimo-Indian dichotomy in southwest Alaska:

> What hostilities and animosities that may exist today between Indians and Eskimos are couched in a Western Indian/Eskimo paradigm which has been imposed from outside within the last 150 years. If these hostilities reflect past attitudes, those, past attitudes were not in terms of Eskimos versus Indians but were in terms of local, individual societal feelings at one particular time about another individual society. "Indianness" or "Eskimoness" was not within the conceptual framework. I want to stress that it is people that interact on a social and, more significant, on a local (usually village) level, not on a morphological/ genetic or linguistic phylum level (Townsend 1979:178).

Given that the Athapaskan expansion closely coincided with the Neo-Eskimo expansion, which in turn coincided closely to the reintroduction of sinew-backed bows to North America, we must now consider whether the mixed Eskimo-Athapaskan cultures of Alaska were realy equal partners in the spread of the newly introduced technologies.

My data does not support the notion that Dena'ina have simply borrowed their sinew-backed bows from their Eskimo Neighbors. Three of the five surviving Dena'ina complex bows which can be positively identified (JES 2691, PAH 2/6361, and PGM 2667-20) each posess quintessentially Athapaskan attached wrist guards in addition to complex sinew backings expertly applied. At the very least, this fact indicates a seamless adaptation of this technology to Athapaskan cultural norms, *not* slavish imitiation.

And I have documented weapons collected from the Aleut of St. Paul's Island and the Koniag of Kodiak Island, both utilizing the Athapaskan-style attached wrist guard (YPM 10054 and JES 366). No evidence justifies the assumption that the technological borrowing was entirely unidirectional. Ives (2010) suggests that understanding the dynamic cultural interface along the vast Eskimo-Athapaskan frontier is crucial to understanding the Athapaskan expansion. He points out that this is analogous to the situation in ancient Central Asia, where equestrian technologies were spread along the vast frontier of Scythian-Altaic bilingualism in the Eurasian steppes. For most of the technologies of the steppes, it is incorrect to claim that they were either Turkic or Persian; they were essentially both at the same time. Likewise this is the case with Indian and Eskimo complex archery technology in southwest Alaska.

Other Northern Athapaskan Bows

There are at least three examples of (non-Dena'ina) Northern Athapaskan complex bows in museum collections that I am aware of (RBCM 6571, NMNH E5588-0, and JES 2687). They are from vastly different regions. JES 2687 was collected in the late nineteenth-century boom-town of Haines, Alaska very near the upper Yukon River. This is a region of high Athapaskan language density, so it could have originated from

one of several different Athapaskan speaking groups. The boy's bow, NMNH E5588-0 is Athapaskan-attributed and was collected along the lower Yukon (Figure 5-14 B.). It was collected in 1867 by the naturalist William Dall, and accessioned to the Smithsonian during the following year. It is functional, but at just 23 inches long, it would work for hunting only mice. I suspect it is of Deg Hit'an manufacture, because Dall (1897:67) describes a scene of Deg Hit'an children hunting mice with miniature bows and arrows, and bartering with the author for candy and trinkets in exchange for their quarry of rodents. Although Dall does not specifically mention acquiring one of these bows, I strongly suspect that this particular bow was purchased around this same time. Just like JES 2687, NMNH E5588-0 is backed with hide thongs rather than sinew. Although one is a tiny miniature, both bows have similar proportions (as though one is a scale model of the other); the configuration and manner of affixing the hide backing cables is similar enough to suggest that they both originate from the same Yukon Athapaskan bowmaking tradition.

The last Northern Athapaskan complex bow (RBCM 6571) is probably Gwich'in, acquired in the Mackenzie River region. This is another place, like western Alaska, where the Gwich'in are generally assumed to have borrowed their complex bows from the Eskimos. This assessment owes largely to the dearth of complex bows in neighboring interior Athapaskan territory to the south and west, and in the northern Canadian Cordillera (McClellan and Denniston 1981:378). This bow is backed with sinew (not hide, like the other two bows), and the backing design is not particularly distinctive—it is generally similar to the configuration of the other two Athapaskan bows, but, not identical due to different material constriants. However some features do seem

to link it to the southern Yukon bow (JES 2687). The bows are similar lengths (one is 46 inches, the other 48.5 inches), and nearly identical width and thickness, maximum at the grip (both are near 1.25 by 0.8 inches), and both have rounded recangular cross-sections (lacking sharp edges). But most significantly, these two far-flung Athapaskan bows have a ~0.25 inch wide blackened trough-like channel running the entire length of the belly surface of the bow, along the midline (Figure 5-21). I do not recall seeing this feature on any of the dozens of Eskimo complex bows I have examined, suggesting it may be a trait common to Athapaskan complex bows.

In summary, these three Northern Athapaskan complex bows (RBCM 6571, NMNH E5588-0, and JES 2687) appear all to be typologically more similar to each other than any one of them is to common varieties Eskimo bows. They are from far-flung extremes of the Athapaskan range (the upper Yukon, the lower Yukon, and the Mackenzie River, respectively). This suggests that the Athapaskans in all three sectors of the Northern Athapaskan bloc have inherited bowmaking traditions from a common ancestral source rather than borrowing it peacemeal from neighboring Eskimo societies. This is not necessarily a direct descendant of proto-Athapaskan bowmaking tradition however, as the groups in question maintained long-distance contacts and could transfer technology to each other at various times. For example, it is possible that the Deg Hit'an lost their complex bowmaking tradition sometime in the past only to have it be subsequently reintroduced by Gwich'in intermediaries.

Osgood (1940:201-202) gives *gił-teŋʔ* as the Deg Hit'an word for 'bow', but only the second element in the compound ('-handle') was intelligible to his informant. The first element is an obscure archaism (at least from the Deg Hit'an perspective). To refer

to a sinew-backed bow, one must add a modifier meaning ‘to tie’: *giɬ-teŋʔ aθeλen*. But the Proto-Athapaskan rootword for the compound *giɬ-teŋʔ* already means ‘sinew-backed bow’; the Deg Hit’an have forgotten the meaning of the element *giɬ,* and thus added a redundant modifier to the term; thus the technical meaning of *giɬ-teŋʔ aθeλen* is ‘*sinew-backed*-sinew-backed bow.’ I asked Victor Golla if this possibly meant that the Deg Hit’an may have lost the knowledge of sinew-backing technology at some point, and then regained it, resulting in this lexical redundancy. He told me that the initial ‘g’-sound is irregular in Deg Hit’an, but regular in Gwich’in, “so the term seems to have been borrowed down the Yukon River in recent times with the meaning ‘bow of any kind’” (Victor Golla, personal communication 10 Dec 2010). This suggests indeed that the specific details of Northern Athapaskan bow technology have been subject to change through time, and that the Gwich’in terms for bows (and maybe the bows themselves) could have been transferred to other Athapaskan groups throughout the Yukon Basin. This provides another interpretive framework for my observations about the remarkable consistency in Northern Athapaskan complex bow morphology among the far-flung Gwich’in, Deg Hit’an, and diverse upper Yukon peoples. But a sample of only three weapons means the strength of these conclusions is somewhat limited.

Summary

Although the Northern Athapaskan complex bow data pool is too small to draw firm conclusions, the few data that I have collected are still surprisingly suggestive considering their numerical limitations. With the notable exception of the glue-type bow region of the southern Canadian Cordillera where no sinew-backed bows have survived, my dataset includes representative samples from virtually every major ethnographically known center of Athapaskan complex bow production in the north. The lack of complex

bows in vast stretches of Northern Athapaskan territory has caused some to suggest that the technology was not originally Athapaskan, but merely borrowed from Eskimos on the periphery of Athapaskan territory. The morphological consistency of non-Eskimo complex bows suggests this might not be the case; the existence of a distinct, early Athapaskan complex bowmaking tradition remains a viable hypothesis, with extensive areas of the Athapaskan heartland subsequently losing this craft. It could simply be that hunting in the subarctic boreal forest environment does not demand the superior complex bow technology, and so the Athapaskans who settled there lost the art of its manufacture. The use of a powerful complex bow in wooded terrain was often unnecessary, and generally not preferred by Northern Athapaskans (Dzeniskevich 1981:124-125). When a diversified subsistence strategy places specialized labor at a premium, and where self-bows are all that is required for effective subsistence hunting, then why would anyone bother to retain so complicated and time consuming a manufacturing process? Bowhunting in the far north can be extremely tedious on the best days, with only marginal returns on a considerable investment in labor (Stefánsson 1913:503). This would mean that the time invested in sinew-backing would be counterproductive, unless interpersonal strife was the root cause. As Roland Bohr writes:

> The subarctic is not an environment that favors archery. Primer raw materials for bowmaking . . . are not available in the region. . . . Native peoples of the subarctic did not generally adopt sinew backing. Even if the tensile strength had been accommodated by some form of sinew backing, bows would still break in the extreme cold, because the wood cells on the belly would collapse when the bow was drawn far enough to launch the fairly long arrows that were common throughout the region (Bohr 2005:193-195).

This point is further emphasized by Foley Benson:

> The bow was utilized by the Kutchin as only one of an array of hunting techniques applicable to any game resource. It is possible that given the other hunting techniques, the bow might have been dispensed with altogether. When the bow was used, it was often a supplemental tool. When it was incorporated as the primary hunting weapon, no demands were made on it for accuracy and trajectory beyond about 30 yards. It appears that there was little need for a high trajectory weapon [like a complex bow] in the Kutchin economy. In fact, such a tool may have been maladaptive in the long term (Benson 1975:40).

Collectively, these assessments serve to affirm that the general lack of complex bows in the Northern Athapaskan heartland was not reflective of some original primitiveness on the part of Athapaskan speakers, but was simply a natural outcome of their cultural ecological circumstances. In Chapter 6, I will address the implications of data for Athapaskan complex archery in the context of a proposed cross-disciplinary synthesis suggesting a substantially revised chronology for the Athapaskan expansion.

Table 5-1. Objects whose provenances were substantially revised or corrected as a result of this study.

Museum code and catalog number	Object description	Cultural affiliation in museum catalog	Corrected cultural affiliation	Comparable objects as basis for correction	Notes
GMA 7336.209	painted self-bow	Unknown	California, Hupa-Yurok or Modoc	MAC 2000-0214 (Hupa-Yurok, made in Modoc style)	Paint similar to Hupa-Yurok sinew-backed bows.
GMA 8426.1895b	sinew-backed bow	Unknown	Apache, likely	Numerous	Many features consistent with typical Apache bows
NMAI 9/8154	sinew-backed bow painted red	Possibly Navajo	AZ Apache, Isleta Pueblo or northwest Navajo	YPM 14368 (Apache, AZ) NMAI 19/3088 (White Mountain Apache, AZ) JES 4455 (Isleta)	Shape is atypical for Navajo. Red paint is rare on Navajo sinew-backed bows (except in northwest)
NMAI 25/1667	sinew-backed bow	Arctic	Northern California, Hupa, likely	YPM 17242 (Hupa) PAH 1/11617 (Hupa)	Glue-type sinew-backed bows unattested in Arctic
PAH 1/14608	painted sinew-backed bow	Northern California	Hupa, likely	YPM-17243 (Hupa)	Unusual paint and sinew application
WFU 1984.E.0437 and WFU 1984.E.0668	plaited splint basket	Athapaskan, Subarctic	Northwest Coast, likely Salish	UFL P-1593 through P-1599 (Salish)	Plaited splint basketry unattested for Athapaskans, but known for Salishans and Wakashans

Table 5-2. Objects whose provenances were substantially revised or corrected as a result of this study.

Museum code and catalog number	Object description	Cultural affiliation listed in museum catalog	Corrected cultural affiliation	Comparable objects as basis for correction	Notes
UFL P-530	sinew-backed bow	Unknown	Copper Eskimo	MPM 33610 (Copper Eskimo)	UFL P-530 is larger than MPM 33610, but is otherwise nearly identical
YPM 15005	sinew-backed bow	Mexico	Central California, Miwok or Wintu	AMNH 50/6439 (Miwok) PAH 1/71850 (Miwok or Wintu)	Miwok bows are very unlike Mexican (southern Apache) sinew-backed bows
YPM 30856	sinew-backed bow	Seminole, Florida	Plains or Southwest, possibly Navajo	MAC 1995-0661A (Northern Navajo or Plains)	Sinew-backed bows are unattested in the Southeast
YPM 145233	sinew-backed bow	Unknown	Apache, likely	Numerous	Grip, tips, paint and cross-section all consistent with typical Apache bows
YPM 145286	sinew-backed bow	Southwest	Apache	MAC 1991-0863 (Apache)	Rare red incised rectangles on sides

Table 5-3. Southern Athapaskan bow morphology.

		Longitudinal shape			Cross-sectional shape code (Figure 4-3).					
Ethnic Group	sample number	single curve	double curve	not sure	B	D	J	L	O	R
Navajo	16	7	8	1	(0.5)-(0.5)-(0)	(10.5)-(11)-(6.5)	(0)-(0)-(0)	(0)-(0)-(0)	(5)-(4.5)-(9.5)	(0)-(0)-(0)
%	100	44	50	6	3-3-0	66-69-41	0-0-0	0-0-0	31-28-59	0-0-0
Jicarilla-Apache	12	1	11	0	(12)-(12)-(11.5)	(0)-(0)-(0)	(0)-(0)-(0.5)	(0)-(0)-(0)	(0)-(0)-(0)	(0)-(0)-(0)
%	100	8	92	0	100-100-96	0-0-0	0-0-4	0-0-0	0-0-0	0-0-0
Non-Jicarilla Apache	8	2	5	1	(1.5)-(1.5)-(0.5)	(4.5)-(4.5)-(3.5)	(1)-(1)-(0)	(0)-(0)-(0)	(1)-(1)-(3)	(0)-(0)-(1)
%	100	25	62.5	12.5	19-19-6	56-56-44	12.5-12.5-0	0-0-0	12.5-12.5-37.5	0-0-12.5
Apache: Subgroup not Specified	31	1	29	1	(12.5)-(17.5)-(7)	(6)-(5)-(3)	(10)-(6)-(3)	(0.5)-(0.5)-(0)	(1)-(0)-(3)	(1)-(2)-(15)
%	100	3	94	3	40-56-22.5	19-16-9.7	32-19-9.7	2-2-0	3-0-9.7	3-6-48
Total Apache	51	4	45	2	(26)-(31)-(19)	(10.5)-(9.5)-(6.5)	(11)-(7)-(3.5)	(0.5)-(0.5)-(0)	(2)-(1)-(6)	(1)-(2)-(16)
%	100	8	88	4	51-61-37	20-19-13	22-14-7	1-1-0	4-2-12	2-4-31
Navajo + non-Jicarilla Apache	24	9	13	2	(2)-(2)-(0.5)	(15)-(15.5)-(10)	(1)-(1)-(0)	(0)-(0)-(0)	(6)-(5.5)-(12.5)	(0)-(0)-(1)
%	100	38	54	8	8-8-2	63-65-42	4-4-0	0-0-0	25-23-50	0-0-4
Total Southern Athapaskan	67	11	53	3	(26.5)-(31.5)-(19)	(21)-(20.5)-(13)	(11)-(7)-(3.5)	(0.5)-(0.5)-(0)	(7)-(5.5)-(15.5)	(1)-(2)-(16)
%	100	16.5	79	4.5	40-47-28	31-31-19	16-10-5	1-1-0	10-8-23	2-3-24

Table 5-4. Southern Athapaskan bow material components.

Ethnic Group	number of bows	sinew-grip: solid	sinew-grip: multiple	sinew grip: barber	sinew grip: combo	sinew grip: form obscure	hide grip	cloth grip	unwrapped grip	unknown grip
Navajo	16	7	1	0	0	1	4	1	2	0
Jicarilla-Apache	12	3	1	3	0	0	0	0	3	2
Non-Jicarilla Apache	8	1	1	1	0	0	3	0	2	0
Apache: Subgroup not Specified	31	3	18	5	2	0	2	0	1	0
Total Apache	51	7	20	9	2	0	5	0	6	2
Total Navajo plus non-Jicarilla Apache	24	8	2	1	0	1	7	1	4	0
Total Southern Athapaskan	67	14	21	9	2	1	9	1	8	2

Table 5-5. Southern Athapaskan bow length measurements (inches).

Ethnic Group	sample number	mean length	maximum length	minimum length	median length	modal length
Navajo	16	43.38	46	39	44	45
Jicarilla-Apache	12	45.38	52	41	43, 45	45
Non-Jicarilla Apache	8	43.09	46	39.5	43	46
Apache: Subgroup not Specified	31	44.62	73	39.5	43	45
Total Apache	51	44.1	73	39.5	43	45
Total Navajo plus non-Jicarilla Apache	24	43.23	46	39	44	46
Total Southern Athapaskan	67	43.91	73	39	43	45

Table 5-6. Pacific Coast Athapaskan, Yurok and Pomo bow length and maximum width (inches).

Ethnic Group	number of bows	mean length	maximum length	minimum length	median length	modal length	mean width at midlimb	maximum width at midlimb	minimum width at midlimb	median width at midlimb
Hupa	24	37.47	49.5	26.5	37.5	39	2.01	3.5	1.13	1.95
Tolowa	4	37.05	38.5	36	37	37	1.78	1.5	1.88	1.9
Tutuni (Rogue River)	1	--	32	32	--	--	--	1.25	1.25	--
Total Oregon Athapaskan	5	36.04	38.5	32	37	37	1.67	1.88	1.25	1.9
Total Pacific Coast Athapaskan	29	37.22	49.5	26.5	37	39	1.95	3.5	1.13	1.9
Yurok	10	40.13	53.25	27.5	40.5	41	2.34	3.19	1.69	2.3
Pomo	1	--	37	37	--	--	--	2.8	2.8	--
Total PCA-type, non-Athapaskan	11	39.84	53.25	27.5	40	41	2.39	3.19	1.69	2.4
Total PCA-type	40	37.94	53.25	26.5	38	37	2.07	3.5	1.13	2

Table 5-7. Pacific Coast Athapaskan, Yurok and Pomo paint colors

Ethnic Group	paint present	paint absent – finished	paint absent - unfinished	red and blue	red and black	orange and blue	orange and black	3 color- red, blue and black	Spiral paint on both sides
Hupa	19	4	1	12	3	3	0	1	2
Tolowa	4	0	0	3	0	0	0	1	0
Tutuni (Rogue River)	0	1	0	0	0	0	0	0	0
Total Oregon Athapaskan	4	1	0	3	0	0	0	1	0
Total Pacific Coast Athapaskan	23	5	1	15	3	3	0	2	2
Yurok	8	2	0	4	0	3	1	0	0
Pomo	1	0	0	1	0	0	0	0	0
Total PCA-type non Athapaskan	9	2	0	5	0	3	1	0	0
Total PCA-type	32	7	1	20	3	6	1	2	2

Table 5-8. Pacific Coast Athapaskan, Yurok and Pomo cross-sectional bow shape. See Figure 4-3 for shape code legend.

Ethnic Group	number of bows	L	D	Q
Hupa	21	(20.5)-(20.5)-(8)	(0.5)-(0.5)-(13)	(0)-(0)-(0)
%	100	98-98-38	2-2-62	0-0-0
Tolowa	3	(2.5)-(3)-(0)	(0.5)-(0)-(3)	(0)-(0)-(0)
%	100	83-100-0	17-0-100	0-0-0
Tutuni (Rogue River)	1	(1)-(1)-(0)	(0)-(0)-(1)	(0)-(0)-(0)
%	100	100-100-0	0-0-100	0-0-0
Total Oregon Athapaskan	4	(3.5)-(4)-(0)	(0.5)-(0)-(4)	(0)-(0)-(0)
%	100	87.5-100-0	12.5-0-100	0-0-0
Total Pacific Coast Athapaskan	25	(24)-(24.5)-(8)	(1)-(0.5)-(17)	(0)-(0)-(0)
%	100	96-98-32	4-2-68	0-0-0
Yurok	9	(7)-(7.5)-(2)	(1)-(0.5)-(7)	(1)-(1)-(0)
%	100	78-83-22	11-6-78	11-11-0
Pomo	1	(1)-(1)-(0)	(0)-(0)-(1)	(0)-(0)-(0)
%	100	100-100-0	0-0-100	0-0-0
Total PCA-type non Athapaskan	10	(8)-(8.5)-(2)	(1)-(0.5)-(8)	(1)-(1)-(0)
%	100	80-85-20	10-5-80	10-10-0
Total PCA-type	35	(32)-(33)-(10)	(2)-(1)-(25)	(1)-(1)-(0)
%	100	91-94-29	6-3-71	3-3-0

Table 5-9. Pacific Coast Athapaskan, Yurok and Pomo bow grip treatments.

Ethnic Group	number of bows	hide grip: solid	hide grip: spiral	cloth grip	string grip	unfinished/ unwrapped	rabbit fur trim
Hupa	24	2	17	3	0	2	3
Tolowa	4	0	4	0	0	0	0
Tutuni (Rogue River)	1	0	0	0	1	0	0
Total Oregon Ath.	5	0	4	0	1	0	0
Total PCA	29	2	21	3	1	2	3
Yurok	10	1	7	0	0	2	0
Pomo	1	0	1	0	0	0	?
Total PCA-type non Athapaskan	11	1	8	0	0	2	0
Total PCA-type	40	3	29	3	1	4	3?

Table 5-10. Numic bow length and width distributions.

Ethnic Group	number of bows	mean length	maximum length	minimum length	median length	constricted at grip
N. Paiute, Bannock, ID	1	40.75	40.75	40.75	41	0
S. Paiute, Beaver, UT	1	38.25	38.25	38.25	38	0
Paiute, Unclassified	1	51	51	51	51	0
Total Paiute	3	43.33	51	38.25	41	0
Shoshone	5	41.7	48	38	42	2
Shoshone+Bannock	6	41.54	48	38	41.5	2
Ute (CO & UT)	3	40.67	45.5	33.5	43	0
Ute+S. Paiute	4	43.25	51	33.5	44.5	0
TOTAL NUMIC	11	41.86	51	33.5	42	2

Table 5-11. Numic bow cross-sectional shape profiles. See Figure 4-3 for shape code legend.

Ethnic Group	number	L	D	Q	O	J	B	R
N. Paiute, Bannock, ID	1	(0.5)-(0.5)-(0)	(0)-(0)-(0)	(0.5)-(0.5)-(1)	(0)-(0)-(0)	(0)-(0)-(0)	(0)-(0)-(0)	(0)-(0)-(0)
%	100	50-50-0	0-0-0	50-50-100	0-0-0	0-0-0	0-0-0	0-0-0
S. Paiute, Beaver, UT	1	(0)-(0)-(0)	(0)-(0)-(0)	(0)-(0)-(0)	(1)-(1)-(1)	(0)-(0)-(0)	(0)-(0)-(0)	(0)-(0)-(0)
%	100	0-0-0	0-0-0	0-0-0	100-100-100	0-0-0	0-0-0	0-0-0
Paiute, Unclassified	1	(0.5)-(0)-(0)	(0)-(1)-(0.5)	(0)-(0)-(0)	(0.5)-(0)-(0.5)	(0)-(0)-(0)	(0)-(0)-(0)	(0)-(0)-(0)
%	100	50-0-0	0-100-50	0-0-0	50-0-50	0-0-0	0-0-0	0-0-0
Total Paiute	3	(1)-(0.5)-(0)	(0)-(1)-(0.5)	(0.5)-(0.5)-(1)	(1.5)-(1)-(1.5)	(0)-(0)-(0)	(0)-(0)-(0)	(0)-(0)-(0)
%	100	33-17-0	0-33-17	17-17-33	50-33-50	0-0-0	0-0-0	0-0-0
Shoshone	5	(3)-(3.5)-(3)	(0)-(0)-(0)	(0.5)-(0.5)-(0)	(0.5)-(0)-(1)	(1)-(1)-(0)	(0)-(0)-(0)	(0)-(0)-(1)
%	100	60-70-60	0-0-0	10-10-0	10-0-20	20-20-0	0-0-0	0-0-20
Shoshone+Bannock	6	(3.5)-(4)-(3)	(0)-(0)-(0)	(1)-(1)-(1)	(0.5)-(0)-(1)	(1)-(1)-(0)	(0)-(0)-(0)	(0)-(0)-(1)
%	100	58-67-50	0-0-0	17-17-17	8-0-17	17-17-0	0-0-0	0-0-17
Ute (CO & UT)	3	(0)-(0)-(0)	(0)-(0)-(0)	(0)-(0)-(0)	(0)-(0)-(0)	(1)-(0)-(0)	(2)-(3)-(1)	(0)-(0)-(2)
%	100	0-0-0	0-0-0	0-0-0	0-0-0	33-0-0	67-100-33	0-0-67
TOTAL NUMIC	11	(4)-(4)-(3)	(0)-(1)-(0.5)	(1)-(1)-(1)	(2)-(1)-(2.5)	(2)-(1)-(0)	(2)-(3)-(1)	(0)-(0)-(3)
%	100	36-36-27	0-9-5	9-9-9	18-9-23	18-9-0	18-27-9	0-0-27

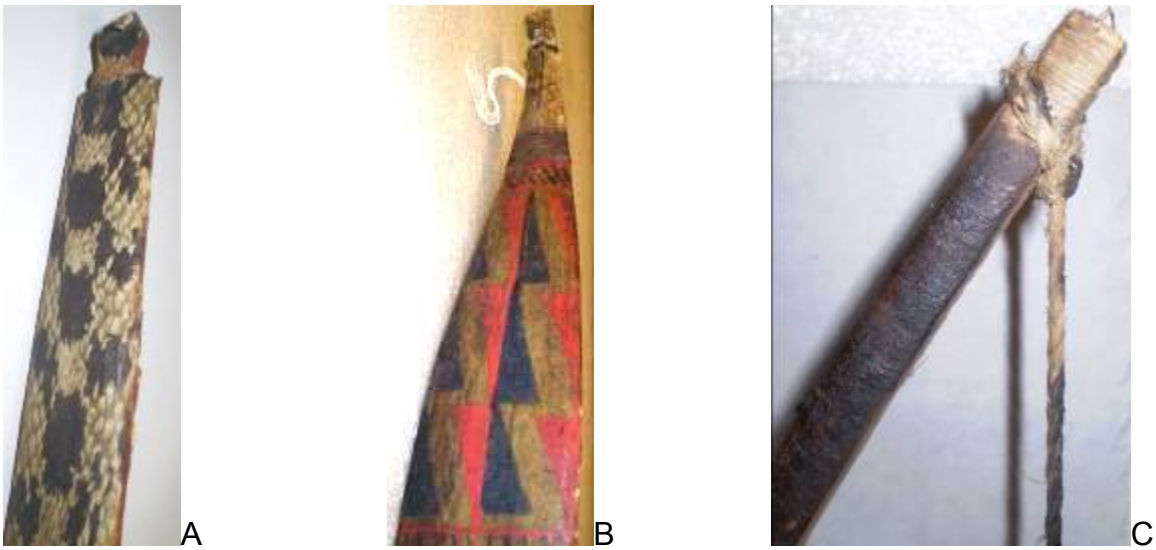


Figure 5-1. Three common surface treatments for the backing material of complex bows. Photos by author. A) AMNH 16/1341, Inland Salish or Nicola Athapaskan bow with snakeskin strip glued over sinew. Courtesy American Museum of Natural History. B) FMNH 14614, Hupa Athapaskan bow from California with heavy coating of paint mixed with fish-glue flux. C) FMNH 61036, Uncompahgre Ute bow from Colorado with heavy coating of bitumen and/or pitch on back and sides. Courtesy Field Museum of Natural History.


A.


B.


C.

Figure 5-2. Comparison of archaeological bow to regional ethnographic specimens. Photos by author. A) PAH 1/174972, Miwok-Costanoan (?) bow fragment from San Francisco Bay area showing possible glue residue. Courtesy of the Phoebe A. Hearst Museum of Anthropology and the Regents of the University of California. B) YPM 15005; Miwok or Wintu sinew-backed bow tip. C.) Side-view of YPM 15005 tip, showing characteristic Miwok 'fiddlehead' profile of sculpted sinew. Courtesy of the Yale Peabody Museum.

Figure 5-3. Detail of Peter Pond's Map of 1785. The headwaters of the Peace River in the Canadian Cordillera correspond to Sekani territory, labeled "Strong Bow Indians". Map reproduced in Ives (2003) and Gillespie (1975).

Figure 5-4. RBCM 6563. Central Canadian Cree or Athapaskan sinew-backed compound bow, thirty-three inches long. Courtesy of the Royal British Columbia Museum.

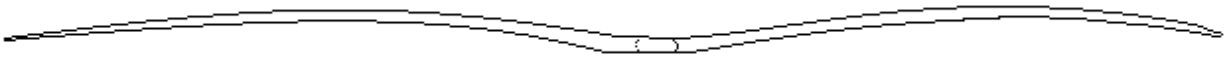


Figure 5-5. Spliced antler belly laths from composite segment bow. Neolithic, late third millennium BCE. Angara River, Yenisei Basin, Lake Baikal region, Siberia. Length not given (after Rausing 1967: Figure 60).

Figure 5-6. NMAI 13/1513. Shoshone sinew-backed true composite bow, thirty-eight inches long. Photo by author. Courtesy of the National Museum of the American Indian

Figure 5-7. PGM 2667-20. Dena'ina Athapaskan sinew-backed bow from Kenai Peninsula, Alaska, with hair fringe and attached wrist guard, fifty-nine inches long. Photo courtesy of the Peter the Great Museum of Anthropology and Ethnography.

A.

B.

Figure 5-8. Western versus eastern style attached wrist guards for Northern Athapaskan bows; note difference in placement of hole for sinew lashings. Photos by author. A) PAH 2/6361; Dena'ina Athapaskan sinew-backed bow from Kenai Peninsula, Alaska. Courtesy of the Phoebe A. Hearst Museum of Anthropology and the Regents of the University of California. B) FMNH 267485; Southern Tutchone Athapaskan self-bow from Whitehorse, Yukon Territory. Courtesy of the Field Museum of Natural History.

Figure 5-9. JES 141; Pomo sinew-backed bow from west-central California, indistinguishable from northwest California Hupa-Yurok bows. Photo by Author. Courtesy of the San Diego Museum of Man.

Figure 5-10. FMNH 17096. Apache double-curved sinew-backed bow; detail of 'barber-pole' sinew-spiral grip-wrap. Photo by author. Courtesy of the Field Museum of Natural History.

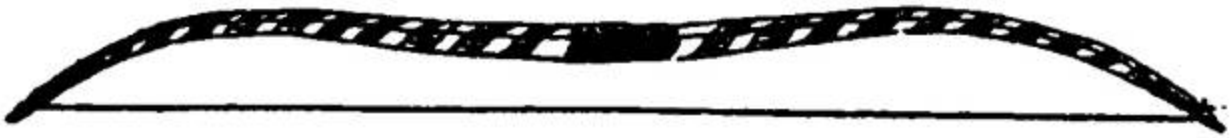
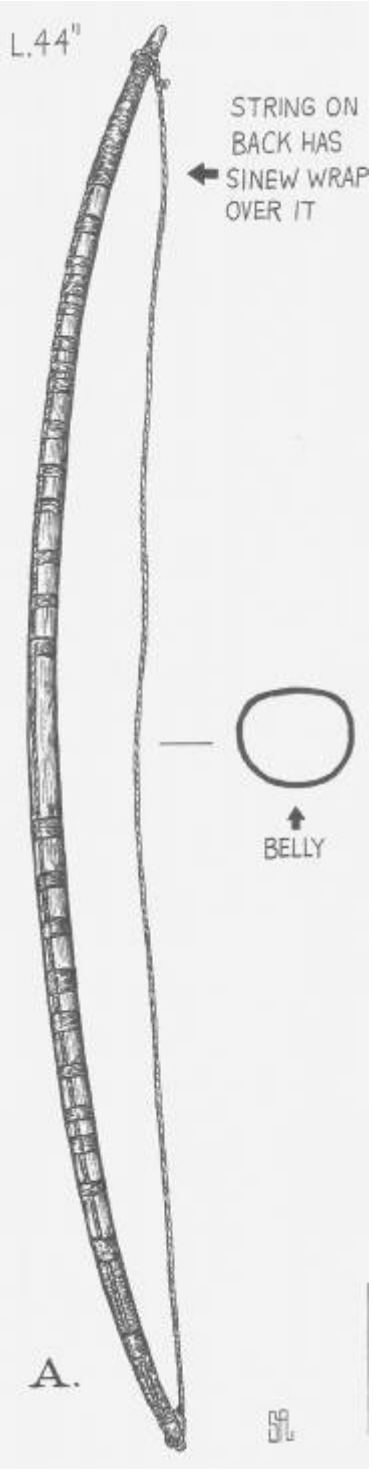
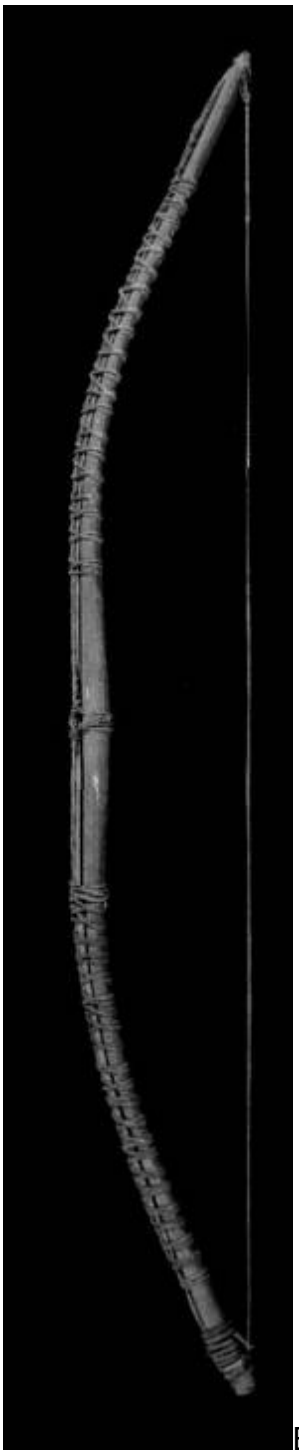


Figure 5-11. Sixty-six inch double-curved Sekani Athapaskan sinew-backed bow from central British Columbia, with barber-spiral wrapping on bowlimbs and nearly rectangular in cross-section (Morice 1894:58).

Figure 5-12. JES 858; Seventy-three inch double-curved Apache sinew-backed bow with nearly rectangular cross-section. Note normal-length Apache double-curved bows in background for scale. Photo by Author. Courtesy of the San Diego Museum of Man.



A.



B.

Figure 5-13. Two Athapaskan-attributed trussed cable-backed short bows, ovate cross-section. A) Likely Apache or Western Navajo sinew-backed bow, Northern Arizona (Allely and Hamm 2002:220); drawing by Steve Allely reproduced by permission of Jim Hamm. B) NMNH E5588; Likely Deg Hit'an Athapaskan boy's bow from Yukon River, Alaska; by permission of Smithsonian Institution.

Figure 5-14. JES 365; Unusual double-curved Northern Athapaskan self-bow with attached wrist guard, upper Yukon River. Photo by Author. Courtesy of the San Diego Museum of Man.

Figure 5-15. Outline of a Qum-Darya (Xiongnu) bow. Author's sketch (after Rausing 1967, Figure 5-f).

A.

B.

Figure 5-16. Comparison of Apache and Slavey longbows (detail of midlimbs). A) AMNH 50.1/7619A, Slavey longbow, rectangular cross-section, 66.1 inches long, 1.57 inches wide at grip. Photo by author. Courtesy of American Museum of Natural History. B) MPM 14748, Apache longbow, rectangular cross-section, 67 inches long, 1.44 inches wide at grip. Photo by author. Courtesy of Milwaukee Public Museum.

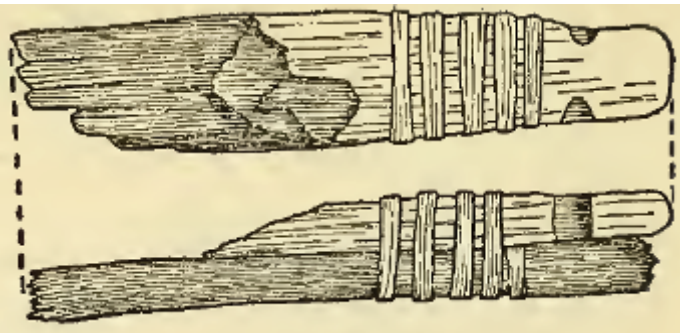


Figure 5-17. 2.5-inch long juniper sinew-back bow fragment excavated by Julian Steward from Promontory Cave No. 1.; northern Utah (specimen now lost); (Steward 1937).

A.

B.

Figure 5-18. Comparison of Promontory Cave bow fragment to decayed ethnographic Shoshone sinew-backed bow tip. A) UMNH 42Bo1 11602.2, belly-view of 800 year old bow fragment from Promontory Point, Utah. Courtesy of Utah Museum of Natural History. B) FMNH 60815, detail, belly-view of Eastern Shoshone sinew-backed bow, collected from Wind River, Wyoming, ca. 1900. Photo by Author. Courtesy of Field Museum of Natural History.

Figure 5-19. PAH 1/21418, back-view of 4.3 inch Lovelock Cave sinew-backed bow fragment, with longitudinal sinew-strands still attached, visible on lower edge (Loud and Harrington 1929: pl. 47m). Photo by author. Courtesy of the Phoebe A. Hearst Museum of Anthropology and the Regents of the University of California.


A.

B.

C.

Figure 5-20. Comparison of “southern”, “Kodiak”, and “western” style used to secure the cable backing to the bow (Murdoch 1885). Only the southern style (far left) uses the bow’s nocks to secure the cable backing. The other two utilize special parallel notches in the sides of the bow. A). YPM 15844, southern style Dena’ina bow, Iliamna, AK. Photo by Roger Colten. Courtesy of the Yale Peabody Museum. B). JES 2681 Kodiak style bow, Kenai, AK. C). JES 2649, western style bow, Yuit, East Cape, Siberia. Photo by author. Courtesy of the San Diego Museum of Man.


A.


B.

Figure 5-21. Comparison of belly-faces of Yukon River and Mackenzie River Athapaskan complex bows. Note blackened longitudinal grooves. A). JES 2687, Southern Yukon babiche-backed bow. Photo by author. Courtesy of the San Diego Museum of Man. B). Mackenzie River sinew-backed bow, photo by Brian Seymour. Courtesy of the Royal British Columbia Museum.

CHAPTER 6
CONCLUSION: PROTO-ATHAPASKAN AND DENE-YENISEIAN MATERIAL CULTURE

Cross-Disciplinary Synthesis

In Chapter 5, I interpreted the data I collected for complex archery in North America as it relates to the problem of Athapaskan migrations and demographic expansion. In Chapter 6, I will address the broader cross-disciplinary implications of these regional and continental-scale ethnohistorical scenarios. The picture is complicated and subject to varying interpretations, but with a broad enough vision, it may be possible to utilize all the major subdisciplines of anthropology to construct a coordinated metanarrative around these numerous data.

Genes, Languages, and Material Culture

Figures 3-8 and 4-5 displayed the close continental-scale patterning of the Na-Dene languages on the one hand, with molecular genetics (Haplogroup C3 Y-DNA) and material cultural data (complex bows) on the other hand. North American haplogroup C3 Y-DNA, is closely associated with Na-Dene speakers and is cladistically rooted in the Altai-Selkup-Ket population system of southwest Siberia (Zegura et al. 2004). The recent and rapid spread of Na-Dene C3 may have been the product of a male mediated migration from Asia (Wilson 2008). Another major male-mediated demographic expansion event took place in Eurasia during the middle Common Era, whereby the Genghis-Khanid Mongols conquered most of the Eurasian landmass during the thirteenth century CE. This event was facilitated by the Mongols' mastery of complex bow technology originating in the Altai-Sayan uplands, and is closely associated with the rapid spread of low-to-moderate frequencies of C3 Y-chromosomes throughout the Eurasian landmass (Zerjal et al. 2003). In other words, the spread of Haplogroup C3 is

linked to a particular material culture (complex bow technology) of the middle Common Era in most of the Eurasian landmass. The Altaian region is the Mongols' traditional homeland, and it is generally believed also to be the homeland of the Yeniseans, linguistic relatives of the Na-Dene.

The rapid expansion (in low-to-moderate frequencies) of Haplogroup C3 is associated with the spread of complex archery in the New World, at precisely the same time (early second millennium CE) as in the Old World. Figure 6-1 combines data from both Figures 3-8 and 4-5 to show that a strong case can be made that complex bows are geographically correlated with the C3 Y-DNA expansion. C3 has been christened both the Genghis-Khanid Y-Chromosome and the Na-Dene Y-Chromosome (Lell et al. 2002; Zerjal et al. 2003). Neither of these designations is a perfect fit, because ethnolinguistic identity is subject to change from one generation to the next (Moore 1994). I suggest tentatively that Y-DNA haplogroup C3 is more strongly correlated with the presence of complex archery than it is with any particular ethnic group

The complex bow may have facilitated the rapid southward expansion of the Athapaskan languages and their associated Y-Chromosomes in the New World. But oddly, neither Athapaskan speakers nor any glue-type complex bows ever made significant inroads into the eastern half of the North American continent, despite the fact that the technology and languages cross-cut major physiographic barriers from Alaska to Mexico. I suggest that these two factors are linked, and the primary constraint in both cases is ecology. In the arid western United States, complex bows can make especially effective tools for subsistence hunting and for raiding, but they are extremely vulnerable to moisture damage. They were similarly successful tools in the rainy Pacific Northwest

only through the development of sophisticated waterproofing techniques (Figure 5-1). The eastward progression of the technology may have been halted by incremental change in precipitation and humidity. The technology is exceedingly rare in those climates where annual rainfall exceeds thirty inches per year.

Historical Scenarios Accounting for Male Mediated Migration

Scholars of Old World history are quite accustomed to 'imperial-scale' ethnic expansions taking place within a few generations. New World prehistorians, in contrast, are much more likely to model similarly significant expansions over several centuries or even millennia. There are some notable recent exceptions to this general rule (Gulløv and McGhee 2006; Sassaman 2010). I would like to encourage more collaboration by specialists working on both sides of Bering Strait. For my proposed synthesis of genetic, linguistic and material cultural evidence to be successful, a number of challenges must be addressed. One major difficulty is the apparent sexual asymmetry of the Na-Dene founding population; very little maternal Mitochondrial DNA can be found to definitively link Athapskan peoples to late Holocene Eurasian populations. This fact must be better accounted for using historical models.

At least three different scenarios could plausibly account for extreme sexual asymmetry among migrant parties in the North Pacific Rim or Bering Sea. These are the (1) mercantile, (2) military and (3) maritime hypotheses.

First, Central Asian male merchant-elite dominated the North Pacific fur trade during the Common Era (especially during the last 1300 years) from headquarters at the trading hubs of the Amur Delta sea ports (Fitzhugh 1994:36-41). Marriages between indigenous northeast Asian women and Central Asian men could have preserved common local 'Beringian' mtDNA lineages, derived ultimately from America via reflux

migrations (Tamm et al. 2007). Children of such mixed marriages, speaking paternally-derived Central Asian languages, could nonetheless have possessed apparently 'Native American' mtDNA lineages (Wilson 2008:272). This period of Central Asian dominance of trade in furs, metals and armaments corresponds precisely to the introduction of the Asian warfare complex to Alaska, between 800 and 1150 CE (Maschner and Jordan 2008), and the pre-Columbian apex of native metalworking in the Subarctic (Clark 1991).

A mercantile hypothesis for Na-Dene origins has distinct resonance with the hypothesis of Gulløv and McGhee (2006) regarding Neo-Eskimo origins; they postulate that aggressive Siberian Punuk/Thule metal-traders may have spurred the Neo-Eskimo expansion in the Common Era. If my interpretation of the material-cultural evidence is correct, the Athapaskan expansion and the neo-Eskimo expansion are two different linguistic-cultural 'fronts' of the same historical process (Ives 2010). The steady intensification of Bering Sea mercantilism throughout the Common Era seems a likely culprit.

> The most obvious weakness of this hypothesis . . . is that many trappings of medieval Asian high civilization were never successfully transplanted to North America. To do so may have been difficult because the Asian immigrants did not constitute large colonies of literate people with advanced metallurgical skills, but lived with a cultural ecology similar to their Native American trade partners. It is plausible that individuals or small groups of highly mobile Asians, limited in their possessions, moved through existing trade networks where local customs prevailed (Wilson 2008:273).

A second possible scenario is military expansionism in the North Pacific, e.g. by Xiongnu or affiliated regiments moving coastward from the northeastern borderlands of their empire. Imperial military cadres were highly mobile groups of men, often multiethnic (including local and foreign soldiers) but united by a lingua franca. This

hypothesis could be linked to the hypothesis (1) above, if men from Yeniseian-speaking garrisons provided security for any of the maritime ports of the northeast Asian fur trade, especially the Amur Delta Hub, which was a key center in the diffusion of Asian material culture to North America (Fitzhugh 1994). A period of Asian imperial expansion "set the stage for a series of rapid political developments in the Bering Straits region", as Maschner and Jordan have argued:

> the introduction of the Asian war complex [to North America] includes the recurve or backed bow, armor, wrist guards, defendable villages or the elaboration of fortifications, and the development of small, specialized arrow points. Most East Asian societies are experiencing a period of imperial expansion during this period (Maschner and Jordan 2008:104).

Mason (1998) and Laufer (1914) provide additional discussion of the diffusion of Asiatic military culture and defensive armor through the Bering Sea and to the Northwest coast in the last two millennia. See Figure 6-3 for a comparison of Na-Dene and Central Asian armor designs. Mason (2009) has further developed a version of this hypothesis in terms of its implications for Neo-Eskimo origins, suggesting that the Neo-Eskimo expansion was initiated by Siberian military cadres. The military hypothesis easily complements the mercantile hypothesis in this case, as war and trade were closely related phenomena in the region (Burch 1988). Merchants and warriors, males united by language, could easily have migrated together. In the most extreme variant of this hypothesis, Ethel Stewart (1991) suggested that Na-Dene founders were male refugee soldiers from the Altai region and Tarim Basin, allies of the defeated Tanguts fleeing Mongol conquests during the early thirteenth century, using riverboats to reach the Amur Delta, thence to Alaska. Her very radical proposal has been dismissed on linguistic grounds (Campbell 1997:261), and admittedly relies upon highly questionable use of the linguistic data. Nonetheless, the historical plausibility of this scenario is

defensible (Wilson 2005). Asianist John Krueger notes “there is no reason why such a migration was not feasible. . . . Stewart has thus presented a challenge to Mongolian studies, one which must be considered and discussed, and refuted, not just dismissed” (Krueger 1993:287-288).

The third scenario for male-mediated migration is the maritime hypothesis, which seems less likely based upon the fact that the bulk of Na-Dene and Yeniseian lexical cognates seem to indicate a shared boreal forest (interior) adaptation rather than a coastal one (Vajda 2010a). Still, it bears mentioning that northeast Asian fishing vessels were crewed by mostly men, and accidental voyages and shipwrecks of storm-tossed vessels were common throughout history. A portion of the many iron artifacts found in late pre-Columbian archaeological contexts doubtless came from such wayward vessels (Keddie 1990), and East Asian survivors of shipwrecks were periodically assimilated by Northwest Coast peoples, as were the three Japanese sailors found living among American Indians in early nineteenth-century British Columbia (Kakuyabashi 1981:516). A few such individuals scattered over the course of centuries would have helped contribute to gene flow from Asia to America, and the observed derived phenotypic traits among Native Americans. A few charismatic individuals could even spread Buddhistic eschatology among the Tlingit or introduce Taoist concepts into the American shamanism complex. These scattered maritime migrations would subtly increase Y-chromosome diversity but be virtually undetectable in terms of mtDNA.

Linguistic Horizons: Proto-Dene-Yeniseian Words for Technologies of Late Holocene Acquisition

The ongoing reconstruction of proto-lexemes in the Dene-Yeniseian languages will ultimately yield much relevant data on the material culture utilized by these speech communities in antiquity. At this preliminary stage of research, Eric Vajda has found a surprisingly robust inventory of words relevant to material culture, apparently consistent with the long-chronology view of Dene-Yeniseian origins, as he points out:

> Cognates in the realm of material culture are also limited to items and practices present on both sides of Bering Strait already many thousands of years ago: snow-sled runner, canoe, holding hook, verb roots denoting specific types of striking motions ('hit endwise with a long object', 'slash') or object deformations ('bend into a hook shape', 'bend less than 180°', 'twist into a spiral'). Predictably, the cognates do not include words for technologies of Late Holocene acquisition, such as the bow and arrow, elaborate storage techniques, or the characteristic North American snowshoes (Vajda 2010b:102).

If there is indeed a lack of Dene-Yeniseian cognate terms for bow and arrow, this would appear to uphold the conventional wisdom that the two populations began diverge prior to the Late Holocene, and the common late prehistoric Asian-Athapaskan culture traits are convergent developments or fortuitous coincidence. Yet Vajda avoids calling attention to his own identification of the verb 'to shoot (an arrow)', in proto-Athapaskan **t'əq'* which is cognate with proto-Yeniseian **däq* (Vadja 2010a:81). Admittedly this verb alone might have once referred to the shooting of an atlatl dart. But Vajda has presumably also chosen to reject the proposed Dene-Yeniseian 'bow and arrow' cognates proposed by Ruhlen (1998:13995). Vajda has rejected them along with over 75% of Ruhlen's proposed Dene-Yeniseian word list. The great bulk of Ruhlen's work, according to Vajda (2010a), consists merely of coincidental look-alikes, unsupported by the rigorous phonological correspondences which are necessary to

prove genetic links. But the basis for rejection of Ruhlen's 'bow/arrow' cognate is not clear, because it is one of Ruhlen's better-supported words according to even Vajda's high standards. The elements of Ruhlen's word list which 'pass muster' (according to Vajda's inspection) include the Dene-Yeniseian words for "birchbark", "stone," and "foot". These 'acceptable' cognates rely upon the same system of sound correspondences (particularly the rules regarding the glottal stop). Ruhlen's proposed word for 'bow/arrow' also follows this rule. Ruhlen discusses the birchbark etymon (which Vajda's work specifically corroborates):

> The Ket word for "birch bark" is *qɨʔy*, . . . almost identical to the word reconstructed for "birch tree" [or "birch bark"] in Proto-Athabaskan: *q'əy. [T]he glottalization in the Proto-Athabaskan form (symbolized as ') has shifted after the vowel in Ket, where it is symbolized as the glottal stop *ʔ*. . . . The difference in phonetic form also has a simple explanation because the different location of the glottal stop in Yeniseian and Na-Dene is not an idiosyncratic feature of the particular word "birch bark," but is rather a recurrent sound correspondence connecting these two families. It affects not just the word for "birch bark," but also the words for "stone," "utensil," "bow," and "foot" (Ruhlen 1998:13994).

Ruhlen (1998:13995) suggests plausibly that the Yeniseian word for 'bow' (**qɨʔǰ*, Ket *qɨʔt,* Yugh *qɨʔt '*), became the Athapaskan word for 'arrow' (**-q'aʔ*, Koyukon *q'oʔ*, Chipewyan *k'a*, Hupa *-q'aʔ*, Mattole *k'aʔ*, Navajo *k'*āʔ). Given that this sound correspondence follows the same phonological rule of thumb as these other words, it is not altogether clear why Vajda rejects it, when he accepts "birchbark", "stone" and "foot". It may be that a tautology is in effect here; Dene-Yeniseian "bow/arrow" terms cannot possibly be valid cognates because of their necessarily late-Holocene historical derivation (in contravention to what we 'know' about Athapaskan prehistory). This logic is suspect and should be reconsidered.

More telling is the specifically proto-Athapaskan word for ‘(sinew-backed) bow’, **ts’əł-təŋʔ* , attested to in all three geographic blocs, e.g. Deg Hit’an *gił-teŋ*ʔ, Dena’ina *cíł-den*, Gwich’in *k’ił-taiʔ*, Hupa *ts’ił-tiŋʔ*, Chipewyan *ʔił-tín*, and Navajo *ʔáł-tìnʔ* (Golla 2007:72; Kari 1978:63; Osgood 1940:201; 1937:213), (Victor Golla, personal communication 7 November 2009). Sinew-backed bow technology was a post-Neolithic Eurasian invention. The presence of a specific term for this technology among the undifferentiated proto-Athapaskans is suggestive. This etymon is absent in Yeniseian; it might be a proto-Athapaskan neologism, in keeping with the well known Athapaskan preference “to use the creative powers of their languages to make new terms” (Ives and Rice 2006). Either way, the possibility of Late Holocene Eurasian origins cannot be discounted.

Proto-Athapaskan Terms for Metal and Knife

There is an intriguing precedent in the presence of a documented Eurasian loanword for an edge weapon and associated raw material in proto-Athapaskan and Eyak. The German term *wanderwort,* ‘wandering word,’ is used by linguists to refer to a widespread loanword in multiple languages whose etymylogical origins may be obscure. In Eurasia, wanderworts are typical in cases of technological diffusion and trade items. The proto-Athapaskan and Eyak words for ‘metal/knife’ are cognate with a wide range of post-Bronze Age Eurasian languages, with the most striking resemblances found in Central Asia, including notably some in the Yenisei river drainage, but not in Yeniseian proper (Golla 1998:2-4; see Table 6-1). There are numerous other American Indian (but not Eskimo-Aleut) languages which have some variation of this Late Holocene trans-Eurasian wanderwort for ‘metal’, however Athapaskan is unique among all the American variants in that it appeared “early enough for the form to have worked its way

into Athabaskan at the proto-language level" in contrast with its presence in Algonkian, Siouan, Iroquoian, etc. sometime after their linguistic diversification had already commenced (Victor Golla, personal communication 18 Aug 2010). Also the Athapaskan variant is most consistent in referring to the metal used in an edge-tool or weapon, whereas many of the other American Indian versions of the lexeme are likely to emphasize other attributes of the metal (especially its color). When the narrower range of Athapaskan meanings and particular stem morphology is considered, then the range of possible Eurasian diffusional sources may be narrowed as well.

Northern Athapaskan fired-copperwork has probable Asian antecedents, and is regarded as the finest example of Native American metallurgy by Witthoft and Eyman (1969:22-23). This high esteem is reflected in the name of the Yellowknife band of Chipewyan. "The recorded names for Yellowknife in Athapaskan, Algonquian, and European languages all appear to refer ultimately to the copper found in their territory from which they made cutting tools for trade to other Indians" (Gillespie and Goddard 1981:288). Interestingly, the specifically Athapaskan terms (Chipewyan: *talʒąhot'inɛ*, 'Yellowknife Indians'; Dogrib: *tehʒǫt'i* 'Chipewyan Indians') reflect an obscure euphemism meaning 'pond-scum people', because of the similarity in color between blue-green algae and blue-green cuprous oxide (289). The Woods Cree (Algonkian) name for them, *miθkohkoma˙n*, 'red metal, red knife', by contrast is remotely linked to the same Eurasian metal-lexeme from which the proto-Athapaskan forms (like Tsuut'ina *mes* and Chipewyan *bes*, both meaning 'knife') are derived (Gillespie and Goddard 1981: 288; Golla 1998:2; Table 6-1).

One striking similarity in Table 6-1 is the near perfect match between the protoform Athapaskan *wəšʷ* 'metal, knife' and North Caucasan (Ubykh) *wəšʷa*, 'copper'. The Dene-Caucasian hypothesis is a direct forerunner to the Dene-Yeniseian hypothesis. Blažek and Bengtson have presaged Vajda's conclusions (quoted on page 265 above) when they write of Dene-Caucasian ("DC") material culuture:

> DC technological terms are all consistent with the late Upper Paleolithic period: awl, thread, rope, cord snare, strap, basket, wooden spoon, wooden bowl, trough, knife (originally of stone), arrow, fence. The house was possibly of a hurdle type (interlaced twigs), supported by a sturdy frame. Starostin ([1991:]33) posits one word for metal, possibly copper, which would have been free copper and not an indication of metallurgy. So DC culture was a typical Upper Paleolithic, hunter-gatherer culture (Blažek and Bengtson 1995:42).

And yet, we must confront the stubborn fact that "evidence of diffusion after a major technological breakthrough, probably annealing, is provided by the widespread late rise to popularity of copper-working among Athapaskans and Eskimos during the second millennium A.D." (Clark 1991:116). Clark also notes that the conceptually related process of heat-treatment of chert and quartzite is not demonstrated to be the impetus for this copper revolution, because heat treatment of lithic raw materials is not attested in the Subarctic. Thus the widespread linguistic evidence for Dene metal use is highly ambiguous and not at all conclusive of the Stone Age origins of the 'metal/knife' and 'bow/arrow' lexemes in particular. There are several independent "diffusional-clusters" of metal words, involving Indo-European, Turkic, and Mongolian languages; the North Caucasian form shown here is intermediate between different Indo-European forms (Golla 1998:6), and strongly suggesting late Holocene origins for the term, corresponding to the period of intensive interaction between Eastern and Western Eurasian languages in the crucible of metal-age cosmopolitanism. If a historical

connection between the Caucasian and Athapaskan lexemes is indeed likely, it is not necessarily of the conventional phylogenetic type, but is more easily explained as owing to the historical extent of a frontier-interface between distinct Asian cultures (Wilson 2008:269). As Wolfgang Behr notes concerning Dene-Sino-Caucasian and related multilateralist proposals:

> Whatever the merits of each of these proposals might be as far as the question of genealogical descent . . . it is likely that most of them may to a certain degree reflect ancient loan contacts . . . during the late Neolithic and early bronze age (Behr 2004:176).

A similar argument pertains for bow and arrow terms in North America. The profusion of certain archery words across language family-boundaries does nothing to support the existence of large genetic units, whether they are hypothetical Pleistocene linguistic megafamilies like Amerind or Dene-Caucasian, or even just the larger of the more generally accepted American phyla like Hokan. This is because the bow and arrow did not exist in North America prior to 4500 years ago at the absolute earliest, considerably postdating the time when each of these large and ancient units would have begun their long process of diversification. The widespread similarities of bow terms are rather more likely a result of widespread borrowing between various distinct populations involved in the transfer of technology in the Late Holocene, not evidence of descent from a remote common ancestor for a large stock with complex branching patterns and great time depth.

Athapaskan is different however, in that it is a smaller family in terms of linguistic diversity (although it is demographically and territorially immense) with “little branching [and] low to moderate time depth” (Kaufman and Golla 2000:52). It is entirely plausible to find protoforms for specific types of archery technology (sinew backed bows)

transmitted throughout the daughter languages in a straightforward phylogenetic fashion. The quality of the linguistic evidence for the spread of archery terms in Athapaskan daughter languages is altogether more lucid than in other American Indian languages. Even though Athapaskan is a very young stock, it is still hypothetically plausible that the recent, rapid continent-wide spread of achery technology and its associated lexicon has also diffused cognate words throughout the family, which now fortuitously resemble protoforms related by common descent. This is very unlikely to be the case though, because the phonological regularity of the lexemes is too consistent and idiomatically integrated into the dialects in question. Loanwords have many diagnostic features; these features are only rarely found in Athapaskan archery terms (the Deg Hit'an example in Chapter 5 is one notable exception). In general, Athapaskans encountering unfamiliar items of foreign origin have strongly favored the creation of neologisms to describe them (Ives and Rice 2006). The overwhelming consistency of the Athapskan archery words (and the regularity of their localized phoenetic variation) is strongly indicative that they are not recent loanwords. They have been recognized as primary roots (that is lineal descendants of proto-Athapaskan) since at least Adrian Morice's time (Morice 1894:55). The likelihood that multiple related languages would come up with the same neologism is improbable in the extreme.

Archery terms in other Native American languages serve to illustrate contrast. Katherine Turner (1983:221) has used archery terms in cognate sets to argue for the common Hokan genetic legacy of California linguistic isolates, Chumash, Esselen, and Salinan, all which have cognate terms for 'bow' similar to *ʔax* or *xak'*. To use this to argue for common descent is problematic for two reasons. First, Chumash is no longer

considered a Hokan language by most linguists (Golla 2007:80). Second, if it were to be included in the stock along with accepted members, it would be grouped among the half-dozen or so California Hokan isolates, as “the eroded remnants of formerly widespread language groups” (Golla 2007:78). In other words, even assuming that all these languages are in fact related, their kinship at or is near the maximum time depth possible within the Hokan stock, well before the introduction of archery to California,. Hokan “is the oldest linguistic relationship among western North American languages that can be established by normal comparative linguistic methods. The time depth of the relationship is on the order of 8,000 years” (Golla 2007:78). California Hokan cognate bow words must have diffused much later, probably along with archery itself. Furthermore, Chumash has separate and distinct words for self-bows versus complex-bows (Turner 1983:221) raising the possibility that the two distinct forms of archery technology were adopted at different times and from different sources.

Joseph Greenberg (1987:146) also compiled a list of bow and arrow terms as a part of his massive and controversial Amerind superphylum, specifically in an attempt to show an archaic relationship between west coast languages (mostly Penutian) and east coast languages (Muskogean). His Natchez lexeme is errant as demonstrated by Kimball (1992:453), and his single proto-Mayan form, **la(:)h* ‘nettle’, has no relation to archery and is therefore irrelevant. Table 6-2 has the remainder of Greenberg’s more plausible ‘Amerind’ archery terms with some additions and corrections from other sources.

The possibility of cognate relationship between the Muskogean, Wappo and Penutian forms is weakened by Kimball’s subtle revision of the Wappo and Muskogean

forms, particularly the proto-Muskogean form "*θaki, which lacks the nasal being compared across the languages" (Kimball 1992:453). Furthermore, Wappo is neighbored by multiple California Penutian languages, and consequentially has a very large number of documented Penutian loanwords (Dixon and Kroeber 1919:115). Even if we accept that all the non-Penutian archery terms are related, they cannot be related within the immense timeframe required for Amerind's alleged post-Pleistocene diversification. Even the divergence between the various substocks of Penutian represented in Greenberg's list is on the order of 6500 years, "comparable to Indo-European" (Golla 2007:75). The bow and arrow did not appear until several millennia later, as John H. Blitz notes.

> [A] continent-wide perspective reveals a north to south chronological distribution for the initial adoption of the bow. Multiple episodes of independent invention or extensive movements of people are rejected as explanations in favor of a secondary diffusion process (Blitz 1988:137).

Looking at Figure 6-4 (from Blitz 1988:132), it appears that the bow was widely adopted in a very short time, appearing in most regions within a few centuries after 500 CE. Blitz's map suggests the apparent route by which it spread throughout the continent was through the Plateau and western Great Basin around 200 CE, thence to the Northwest Coast and California, Plains, Southwest and Northeast, all between 500 and 600 CE. Among the last regions to see archery technology was the Muskogean Southeast, between 700 and 800 CE (and also, as we shall see, the Subarctic). So it is at least fathomable that Plateau Penutian speakers, who were among the earliest archers in the middle-lattitudes, were also involved in the transmission of archery technology to their linguistic relatives in California, and also later (possibly through

intermediaries) to the Southeast. Plateau Penutian archery vocabulary may therefore have diffused in association with the weapon itself.

Only one physiographic region or culture area on Blitz's map is entirely blank: the Subarctic. This is because archaeological information regarding the date of the adoption of archery was very poor there at the time of his writing (contemporary data are discussed below). Even as late as the 1990s, there was little certainty when archery first appeared, particularly in the Western Subarctic. Looking at the map of Northern Athapaskan territory (Figure 3-8A), the alleged proto-Athapaskan homeland is squarely in this vast zone of uncertainty (Figure 4-5). The southern margin of the Subarctic (bordering the Plateau and Northern Plains) yields ample evidence for archery in the early Common Era. Yet Athapaskan incursions into this frontier (Beaver and Chipewyan south and east of Lake Athabasca, Chilcotin south into the Plateau borderlands, and Sarsi into the Northern Plains) all occurred sometime between the thirteenth century and historical times, long after the continental ubiquity of archery was well established (Smith 1987; Wilmeth 1977). The question of the physical evidence of archery in the proto-Athapaskan homeland is discussed at length by Donald W. Clark:

> The first firm evidence that northern Indians used the bow and arrow is relatively late. . . . Subarctic peoples began to use bows and arrows only a few centuries ago. That is later than when archery was adopted elsewhere on the continent. . . . Nevertheless, doubts remain as to whether the features of stone points are reliable guides for identifying them as either arrow or spear points. In late prehistoric times, arrowheads were usually made from bone and antler, and some locally were pounded out of native copper. . . . As bone and antler have a poor preservation record in the Subarctic, it may be premature to assume that the absence in the earlier archaeological sites of points made of those materials indicates that the bow and arrow was not yet in use. . . . [I] t is difficult to determine how widely the bow and arrow was used in the Western Subarctic or when it was first adopted (Clark 1991:102-103).

Archeological Horizons

Work done in the late 1990s and early 2000s suddenly and radically changed this situation, as a large number of more-or-less complete projectiles with bone and antler points intact, sinew bindings, and wooden shafts have been collected from permanent ice patches in Wrangell-St. Elias National Park, Southeast Alaska, yielding a plethora of ironclad ^{14}C dates (Dixon et al. 2005; Hare et al. 2004). "The first unequivocal evidence of bow and arrow is three fragments of a maple bow" dating around 700 CE and the last evidence of atlatls disappeared within about a century of that time (Hare et al. 2004:270). The ubiquity of bow-and-arrow technology was not established until 850 CE in most of Krauss and Golla's (1981) proposed area for the proto-Athapaskan homeland, the borderlands between southeast interior Alaska, southwest Yukon Territory, and northwest British Columbia (Ives 2010:328). The transition from darts to arrows in the region is also clearly indicated by a transition from stone spearpoints to barbed antler arrowheads and a transition from birch to spruce as the predominant shaft-wood for the projectiles (Hare et al. 2004:270). The transition later culminated in the southern Yukon (like the western Subarctic as a whole) with common Athapaskan use of annealed copper arrowheads and obsidian-tipped antler arrowheads in the second millennium CE, particularly after circa 1200 CE, "signaling a greater reliance on the bow and arrow" (Clark 1991:67).

This chronology is problematic from the standpoint of Athapaskan linguistics because "a cognate bow terminology exists throughout Athapaskan, whose speech communities [presumably] must have begun diverging [from the region in question] long before the adoption of bows and arrows" (Ives 2010:328). This same problem is exacerbated by existence of Asian cognates for the 'metal/knife' and 'bow/arrow' terms

already discussed. As Ives himself told me, “[i]f Dene ancestors were not living in that vast region for at least the last two millennia, I'd say we haven't the least idea about anything in Dene prehistory” (John Ives, personal communication 8 Aug 2010). Consequently, Ives maintains, the proto-Athapaskans must have possessed an ancient cultural frontier with Eskimoid peoples who did possess archery, and thus could have been cognizant of its use long before they (the Athapaskans) themselves adopted it (Ives 2010:328-329).

Ives offers an enterprising solution, but it is insufficient for two main reasons. First, while the early paleo-Eskimos (pre-Dorset) were indeed proficient archers 4000-5000 years ago, as suggested by Blitz (1988), their use of the weapon never caught on elsewhere, and completely vanished for more than 2000 years during later (Dorset) Paleo-Eskimo timeframes. Pre-Dorset archery artifacts have no counterparts in *any* Dorset stratum (Meldgaard 1962:pl. 5). The second problem is the hypothetical location of the proto-Athapaskan homeland in the region in question, which is really only “(sort of) near the area of great divergence” (Kari 2010:210). These borderlands were selected as the urheimat by default, precisely to avoid the problem of long term interaction with Eskimoid peoples, which seemingly would have left ample linguistic substratum influences absent in proto-Athapaskan (Krauss and Golla 1981:68). On internal linguistic evidence alone, the proto-Athapaskan homeland should be sought in central or western interior Alaska, nearer to Eskimos and also much nearer to the main beachhead for transoceanic migrations (Kari 1989:538-539). A more westerly Alaskan homeland would thus be closer to ground zero for the diffusion of Asiatic archery technology.

In the last 2000 years, the Asiatic bow and arrow has radically transformed the entire Western hemisphere, both in terms of hunting economy and warfare. It seems counterintuitive that archery could have been introduced from Siberia, flourished for an extended period circa 5000 years ago, but have been completely extinguished in the north slightly less than 3000 years ago. Yet this should come as no surprise to anyone familiar with the general arc of Arctic prehistory. As Krupnik notes:

> the evolution of weapons and technology in the Eskimo hunting economy moved in a spiral, not in a linear, progressive fashion. . . . [T]he entire traditional complex of Eskimo hunting equipment was essentially formed . . . some two thousand years ago—several clear periods can be defined in those two millennia when it was simplified or even reverted to original, more primitive forms [in a] . . . developmental model of vivid explosions alternating with regression to . . . long outmoded forms (Krupnik 1993:197-198).

The sudden reappearance of Asiatic archery technology in Alaska during the middle Common Era accords roughly with the shortest linguistic chronology (circa 1300 years depth) proposed by Hoijer (1956), and also with the dramatic explosion in native copper-use. Proto-Athapaskan metal-terms and archery-terms both make sense in this context if one allows that the Athapaskan languages were linguistically undifferentiated and geographically limited during this time period. These are defensible positions on both archaeological and historical-linguistic grounds. However, we have yet to address the issue of complex, sinew-backed bows, whose presence is not established by the recent archaeological data. Recall that proto-Athapaskan **ts'əɬ-təŋʔ* specifically means '(sinew-backed) bow'. To date, none of the bows unearthed (or 'de-iced') in and around Wrangell-St. Elias are anything but self-bows (John Ives, personsal communication 8 Aug 2010), and furthermore, very few east-central interior Alaskan Athapaskans were known to use sinew-backed bows in the ethnographic record, in contrast to virtually all

of the westernmost Alaskan Athapaskans and Eyak who did in fact use sinew-backed bows (Driver and Massey 1957:352).

It is difficult to precisely date the arrival of the sinew-backed bow in Alaska. There are some probable late Punuk or Thule archaeological specimens of compound bow parts on the Siberian side of Bering Strait, at Cape Chaplino on the east coast of the Chukchi Peninsula, but these have not been dated (Mason 2009:84). The ~3900 year-old (pre-Dorset) bow bracers found at Igloolik (Eastern Arctic) were indeed used in the manufacture of complex bows (Meldgaard 1960:74-75). However, this fact has no bearing on this question, because "Dorset never adopted these technologies" (Agger and Maschner 2009:322) and the pre-Dorset were long-extinct when the proto-Athapaskan speech community existed. The lack of firm evidence for the reintroduction of the weapons to North America means that some guesswork is involved, but it seems reasonable to say that the strong complex bow arrived in most regions of western North America within a few centuries of the initial (re-)appearance of bows in general in North America. Maschner and Jordan make the case that, as a key element in the "Asian warfare complex," the sinew-backed bow was a catalyst for the escalation of hemispheric violence in the second millennium CE.

> [T]he recurve bow and its accoutrements changed warfare. It created powerful groups who could easily annihilate peoples who were not using it. As this technology spread through North America in the centuries just prior to AD 1150, it became the de facto means of military aggression in every region. We believe that by AD 1150, a threshold had been reached where every single group in the Americas was under the threat of a potential violent conflict and something, somewhere, snapped, causing a cascade of change across the hemisphere (Maschner and Jordan 2008:105).

The bows found preserved in caves in the Southwest and northern Great Basin are exclusively self bows until at least the thirteenth century. Likewise the artistic

renderings of archery in Puebloan ceramics are exclusively self bows until at least the late twelfth century CE. In the Southwest "the adoption of the sinew-backed, recurved bow dates to somewhere between A.D. 1200 and A.D. 1450" (LeBlanc 1999:103). The archaeological evidence for the arrival of the sinew-backed bow in California is even more ambiguous because of poorer preservation of organic remains. The linguistic evidence is unequivocal about the presence of archery technology in the proto-Pacific Coast Athapaskan (PCA) community, who were one of the last ethnic groups (if not *the* last) to arrive in prehistoric California. Refering to proto-PCA archery lexemes, Victor Golla writes:

> This seems to me incontrovertible evidence that the linguistic ancestors of the Pacific Coast Athabaskans entered the area with the bow and arrow, and probably with knowledge of the sinew-backing technique. Whether or not Athabaskans were responsible for the spread of bow-and-arrow technology into California, the first archaeological appearance here of projectile points that can be classified as arrowheads (apparently ca. 600 AD) undoubtedly marks the earliest possible date for an Athabaskan presence in the region (Victor Golla, personal commnication 7 Nov 2009).

The arrival of the bow and arrow in California in 500-600 CE is no doubt a terminus post quem for the arrival of the Athapaskans. However, it would be unlikely that they came at this early date if they had original knowledge of the sinew-backing technique, as is extremely likely based on the linguistic data. Whistler (1979) favors a thirteenth century CE date for the entrance of Athapaskan speakers, based on a combination of linguistics, archaeology, and ethnographic reconstruction. This date is also in good accord with the earliest estimates for the arrival of the sinew-backed bow in another region (the Southwest) as noted by LeBlanc (1999:103). Other linguistic candidates for early archery in California are the Penutian speakers, who I hypothesize may have adopted the bow-and-arrow circa 500-600 CE through long-distance

interactions with their Plateau-Penutian linguistic brethren. Given the evidence that the closest linguistic relatives of PCA communities were Plateau Athapaskans (e.g. Nicola and Chilcotin) who also possessed similar sinew-backed bow technology, it seems that there may have been an enduring north-to-south acculturation gradient involved in migration and the diffusion of weapons technologies from Asia, through the Plateau, to California. By this route, self bows could have bypassed the more remote subarctic tundra at an early date. The ultimate Asian origin of the bow and arrow might be traceable in the stunning similarity between Siberian Uralic and Central California Penutian archery and weapons terminology noted by Otto von Sadovszky (1996:26-27).

Von Sadovszky (1996:270) suggested that the Penutian and Uralic languages were phylogenetically linked, and that the Penutian languages must have diverged from a Siberian source language after the proto-Ugrian period (later than 500 BCE). His work has not been well received by Americanists who rightfully note that the divergence between the Penutian languages themselves is much greater than this timeframe would allow. Nonetheless, his voluminous data are compelling even if he did not produce a plausible historical scenario to account for them. Late, rapid coastal migrations from Siberia to the Pacific Northwest would certainly help to account for the appearance of archery in California and the Plateau several centuries earlier than interior Alaska. I suspect that non-genetic factors (that is, linguistic borrowing) may be at play here more than von Sadovszky would admit. Enduring contacts between distantly related groups in the North Pacific Rim could result in an uneven patchwork of lexical innovation and loanwords following the spread of new technology.

It is quite reasonable that bows and arrows could spread from person to person through existing populations as is conventionally assumed, but the incredible speed of the diffusion (continent-wide in only a few centuries) implies that long-distance travel of individual culture-bearers must have been involved at some stage, because the craft of the bowyer is such that instantaneous transfer of the required skill-set between ethnic groups seems unlikely. This is especially true for complex archery. The manufacture of strong complex bows is a discipline exclusively associated with intensively trained full-time craft specialists in the Old World. With some exceptions, this is not generally the case in North America. Complex bowmaking nonetheless required considerable time and expertise, and was not something undertaken casually (Bergmann and McEwen 1997:159). This seems to preclude the likelihood that advanced weapons technology would spread like wildfire in the absence of a major migration. The physical presence of the Athapaskans remains the most plausible vector accounting for the lightning-fast dispersal of complex bows from Alaska as far as California and New Mexico.

Scholars need not shy away from the possible historical implications of von Sadovszky's much-maligned Uralic-Penutian hypothesis, nor should we be afraid to subject Vajda's widely acclaimed Dene-Yeniseian data to the same sort of broad historical critique. Asian-American prehistoric relationships may be subtle and many-layered, ultimately much more complicated than a single phyletic branchpoint on the map of Siberia. It should be asked whether language families like Na-Dene and Penutian may in fact be polygenetic 'hybrids' with significant inheritance both from post-Pleistocence North-America and from post-Bronze Age Eurasia (cf. Dimmendaal 1995).

Proto-Athapaskan Pottery Words

The final piece in the linguistic puzzle to be addressed here is just as fraught with historical ambiguity as the proto-Athapaskan words for metal/knife (**weš^{w}*), sinew-backed bow (**ts'əɬ-təŋʔ*), and arrow (**-q'aʔ*). The evidence of a proto-Athapaskan word for pottery (**ons·a', *as·a'* or **'usa:k'*) is equally problematic, because the vast bulk of Northern Athapaskan territory never possessed ceramics until European contact (Driver and Massey 1957:230). This vast subarctic 'ceramic-free zone' notably includes the entirety of Krauss and Golla's (1981) putative proto-Athapaskan homeland in eastern Interior Alaska and northwest Canada. However, pottery is well attested in western Interior Alaska, the region of the greatest Athapaskan linguistic and cultural diversity. James Kari (1989:566 n.3) notes the existence of aboriginal pottery traditions among the Lime Village Dena'ina, Yukon Deg Hit'an, Upper Kuskokwim Athapaskans, and Tsuut'ina. At least nine different Northern and Southern Athapaskan languages have a variant of the same term for 'clay pot' or 'kettle' (Table 6-4).

The Tanana and Koyukon in west-central Alaska were also very proficient potters (Rainey 1939:376-377). A portion of Kaska territory in north-central British Columbia (a quadrant bordering the Tahltan) are also indicated by Driver and Massey (1957:340, Map 127) as a native source of ceramic pottery according to ethnographic records, but I have not found primary sources confirming this. It is tempting to view Tsuut'ina pottery as a northern extension of Plains ceramic traditions. However, Edward Sapir's ethnographic work among the Tsuut'ina was strongly suggestive of northern/Alaskan origins for their pottery. Their Blackfeet allies (from whom they learned most Plains culture traits) are less certainly associated with the ceramics craft than are the Tsuut'ina

themselves, and Tsuut'ina pottery also shares with Alaskan ceramics a highly unusual low-fire animal-hair organic temper. Sapir writes:

> It is natural to look upon the pottery of the Blackfoot and Sarcee [Tsuut'ina] country as but a marginal outpost of the more intensive pottery culture of the Mississippi Valley and the western Great Lakes. Is it not at least possible, however, that the old Sarcee pottery, of which the Indians retain such a clear tradition, is the survival of a northern type that is historically connected with the Eskimo ware or that it represents a compromise between northern and eastern streams of influence? . . . [It seems possible] that pottery was more extensively used among the Sarcee than among the Blackfoot or, at any rate, the Piegan, the southernmost of the three Blackfoot tribes (Sapir 1923:252).

The archaeological traces of ceramics scattered near the lakes to the east and northeast of the Tsuut'ina are almost certainly extensions of more easterly and southeasterly cultures, probably Algonkian (less than 1000 years old) and not ancestral Chipewyan (current residents of the region), who themselves possessed no ceramics tradition (Wintemberg 1942:131; Ives 2003:276). Nonetheless, the existence of proto-Athapaskan pottery terminology is another major problem for the standard models of the Athapaskan expansion which locate the epicenter of this expansion deep within the 'aceramic' northwestern continental interior 2000 or more years ago. John Ives approaches the dilemma the same way that he does for the archery problem, by positing that the proto-Athapaskans must have long known about pottery via contacts with Eskimo neighbors, without actually adopting it themselves (cf. Sassaman 1993). He notes that ceramics industries, though apparent on the Alaska Coast for 4,000 years, were not well established in the American Arctic until the Norton period after 500 BCE.

> A Neoeskimo tradition of pottery then extends into the recent past (influencing neighboring Dene like the Deg Hit'an and Koyukon). None of these ancient ceramic traditions necessarily occur within regions thought to contain the Dene homeland, but they *do* occur adjacent to Athapaskan

> homeland regions. Otherwise, ceramics are simply absent over vast regions of interior northwestern North America throughout the last 4000 years, in a time range when Dene ancestors must have been widespread in the western Subarctic. Despite this absence, a clay pottery term is found throughout Northern Athapaskan and Apachean (though not Pacific Athapaskan), as Sapir (1923) pointed out. Once again, it would appear that Athapaskan ancestors were aware of the technology, but they did not adopt it for their own use until Apachean ancestors took up ceramics (Ives 2010:329).

I am not convinced that this reasoning is sufficient to account for the data. Take the example of the Pacific Coast Athapaskans who Ives mentioned. They are also descended from the proto-Athapaskans who should have been aware of pottery at the very least. And yet they retain no equivalent word for the technology, having evidently lost it themselves at some point after a just few centuries in California and Oregon, a region completely lacking in ceramics (Figure 6-3). As Sapir writes:

> The term is apparently absent in Pacific Athabaskan. Presumably the Athabaskan term originally referred to a pail-like or kettle-like receptacle of bark, only secondarily to one of clay. And yet can we be sure that its primary meaning was not "clay pot"? If it was, we could understand why it was lost in the Pacific dialects, for a term for clay cooking vessel would not be readily used for one of twined basketry, while a term for bark vessel conceivably might be (Sapir 1923:253).

Of the nine Athapaskan groups listed above as possessing the proto-Athapaskan pottery word, four of them (Deg Hit'an, Dena'ina, Tsuut'ina, Navajo) were known manufacturers and users of ceramics in pre-contact timeframes. Two more (Beaver, Sekani) were close kin of the Tsuut'ina, with oral traditions of their common origin. If the Tsuut'ina were originally potters (as Sapir suggests) it is almost certain that Beaver and Sekani were also potters at one time, because all three groups were undifferentiated in the recent past. The Carrier in turn sustained close contact with this whole bloc long before it differentiated. The other two groups (Hare and Mountain) formed one bloc in direct contact with Mackenzie Eskimo potters of arctic coastal Canada. Alaska-derived

Thule pottery was more abundant than soapstone in the late prehistoric Mackenzie Delta region (Morrison 1991:240-242).

The extinct Hare and Mountain bands are so poorly studied that it may be impossible to determine the extent of their knowledge of any particular technologies. In summary, pre-contact direct knowledge of ceramics can plausibly be attributed to all of the abovementioned groups, whereas I am unaware of any of the Athapaskans of the putative homeland region (southeast interior Alaska, adjacent tracts of British Columbia and Yukon Territory) who maintain any variant of the proto-Athapaskan word for 'clay pot'. Could it thus be possible, as Ives suggests, that this lexical knowledge was maintained for thousands of years in this vast 'aceramic' heartland region, when the equally 'aceramic' PCA bloc lost it through erosion in less than 1000 years? It is more reasonable to suggest (with Kari 1989) that the proto-Athapaskan homeland is to be found in western Alaska, where ceramics industries were indeed present.

Also noteworthy in this regard is the Dene-Yeniseian cognate term for dish, proposed by Ruhlen, which also could include items of ceramic manufacture (1998:13996). The Yeniseian word **sɨʔk,* attested in both Ket and Yugh, refers to a trough-like bowl for bread dough. It is comparable to many Na-Dene words for dish or plate, for example Tlingit *s'ix'*, Ahtna *tˢ'āk'*, Dena'ina *tˢ'uk'*, and Beaver *tˢ'āʔ*. This proposed cognate also obeys the phoenetic principles governing the shift of the glottal stop, like "birchbark" and "bow/arrow". It thus appears to withstand Vajda's scrutiny, although Vajda does not comment upon it in his recent (2010a) essay.

Hair-tempered Pottery in the New World

The final point to be made about Athapaskan pottery concerns the extreme rarity of animal-hair temper in North America, in the context of late neo-Eskimo low-fired

ceramics. What was once dismissed as neo-Eskimo crudeness (merely the attenuation of more refined ceramics of paleo-Eskimo times) is more accurately characterized as Thule versatility, as Thule potters "adjusted temper and the firing regime to adapt their ceramics to a variety of resource areas in an environment badly suited to pottery manufacture" (Stimmell and Stromberg 1986: 237; see also Harry et al. 2009). This adaptation permitted the expansion of ceramics industries into more mobile groups, including the interior Athapaskans.

> Organic-tempered ceramics have superior performance characteristics during manufacture, allowing for an expedient ceramic technology. This, along with reduced weight and greater portability, may explain the preference for organic-tempered vessels by groups that frequently shift their residence (Skibo et al. 1989:122).

Notably, low-fired organic-temper pots are also particularly susceptible to total decomposition in a moist environment when subjected to freeze-thaw cycles, meaning archaeologists doubtless have underestimated the extent of their use (Reid 1984). It may be that hair-tempers have greater antiquity and range than we are presently aware of, however it is still safe to say for the most part they are a very late neo-Eskimo technology in America. It is uncertain whether northeast Asian hair-tempered pots are beholden to Japanese fiber-tempered ceramics, but hair temper emerged in the Lena valley, Siberia at the terminal Neolithic, and spanned the Bronze Age. During this time, the technology spread eastward into the Chukchi Peninsula, first appearing on the Siberian side of Bering Strait during late paleo-Eskimo timeframes (circa 2000 years ago) and substantially later in Alaska.

> On the American side, in marked contrast, hair temper is relatively recent, the oldest examples dating from A.D. 1250 to 1400 on the Kobuk River (Giddings 1952:94-5). It is also mentioned for the Tena [Deg Hit'an] Indians of the middle Yukon (De Laguna 1947:141) and for the modern Alaskan Eskimo—locality unspecified (Collins 1937:167), but is the least common

> organic material encountered in Alaskan pottery. Elsewhere in North America it is reported ethnographically from the Sarcee [Tsuut'ina] and Kutenai (Oswalt 1955:41), but otherwise seems not to be known (Chard 1958:193).

The Kutenai resided due south and nearly adjacent to the Tsuut'ina, and could have easily learned Tsuut'ina horsehair-temper ceramic technique as a result of marriage alliances formed in conjunction with long-term cooperative hunting arrangements. "The hunt of the buffalo led to certain alliances and unions for the season of the chase . . . a few of which may have become permanent. Thus the Kutenai [and] Sarsi . . . hunted together on the plains of the Saskatchewan and the upper Missouri" (Chamberlain 1907:478). Hair temper is otherwise most closely identified with the Tanana, Kuskokwim and Koyukon Athapaskans of central Alaska, who used bear hair-temper in their pottery (Rainey 1939:376-377). Koyukon of Alaska also shared with Tsuut'ina of the northwest Plains some specific molding techniques (direct molding and bark molding) which are not widespread elsewhere.

Wendell Oswalt (1955:41) comments on these and other general similarities between northwest Plains and Alaskan pottery (e.g. cylindrical forms, oiling and water-testing of finished pots), that "some of these features may be found among any pottery-using people, but the important fact is that these particular technics all are common to 2 geographically disconnected groups who are the most proximal pottery manufacturers in northwestern North America." He further addresses the discipline-wide implications of these facts, noting that "If such a technological relationship did exist, it would be highly significant on distributional grounds and demonstrate that a 2000-mile spatial gap without pottery is insignificant to its spread" (Oswalt 1955:41).

The proto-Athapaskan linguistic evidence (**ons˗a'*, **as˗a'*, **'usa:k'*, 'clay pot') would seem to bear Oswalt out, particularly when you look at the lexicostatistical evidence suggesting that western Alaska may have been the proto-Athapaskan homeland (Kari 1989; Sapir 1923). Particularly noteworthy is the fact that Tanana and its nearest Alaskan Athapaskan neighbors (Tanacross and Ahtna) all share a mean retention ratio (average number of shared cognates) of exactly 69.2%, consistent with the three languages having diverged from each other in situ. Tsuut'ina has the next-nearest ratio of 69.6% shared cognates, causing Fowler (1977:103-104) to speculate that Tsuut'ina and Tanana were also geographical neighbors in this same region at around the same time, a few centuries ago. Tsuut'ina manufacture of distinctive low-fired hair-tempered pottery similar to Tanana pottery, and use of the word *as˗ạ'* 'clay pot' would seem to point to a departure from western Alaska during the early Neo-Eskimo period after circa 1000 CE, when hair-tempered pottery crossed Bering Strait and made inroads to the interior. Regarding this dating, Dzensikevich (1981:123) says that Northern Athapaskan ceramics "could not appear in Alaska earlier than the 10th century," See Figure 6-5 for a visual comparison of Tsuut'ina and Alaskan ceramics.

Corroborating Evidence for Late Dispersals from Western Alaska

Several material cultural traits come into focus here. The abovementioned timeframe is also roughly the period (after circa 1000 CE) when we can say with relative certainty that the Asian sinew-backed bow was reintroduced to western Alaska (Maschner and Jordan 2008:105). This is another Eurasian technology closely identified with a proto-Athapaskan root-word, **ts'əɬ-təŋʔ*. This is the same period that unprecedented amount of annealed copper-work diffused rapidly through the interior western Subarctic along with a booming copper trade (Clark 1991:84). The proto-

Athapaskan root-word *$*weš^w$*, 'knife, metal' is linked to several Central Asian source languages, and may be a trans-Eurasian *wanderwort* (Table 6-1). Finally, it bears mentioning another cultural feature with a similar geographic distribution to pottery and complex bows. Hard-soled leather footgear is ubiquitous among the Southern and Pacific Coast Athapaskans, but is found in the far north among only Eskimos, Tsuu'tina, and western Alaskan Athapaskans, e.g. Deg Hit'an (Driver and Massey 1957:326-328). Driver and Massey note:

> The distribution of the hard-soled moccasin is more difficult to explain. Its Oasis, Great Basin, and Plains occurrences favor derivation from the hide sandal. Some of the awkward kinds of Pueblo moccasins suggest the addition of an upper to a sandal. However that may be, a hard and stiff sole is good protection from the thorns and stones of the deserts and plains of the West. In the wooded East, the soft-soled type was sufficient. The hard and separate soled Eskimo boots appear to have developed independently of the hard- soled forms of footgear to the south. The Eskimo boot is apparently of Asiatic origin, and may even be historically related to the riding boots there (Driver and Massey 1957:328).

Tsuut'ina hair-tempered pottery traditions suggest rapid long-distance dispersal from western Alaska within the last 1000 years. The intervening Subarctic is dominated by soft-soled moccasins which are closely associated with the use of snowshoes. But nothing precludes the suggestion that the Tsuut'ina also brought their hard-soled shoes with them from western Alaska during their rapid expansion. The possible Asiatic derivation of Southern and Pacific Coast Athapaskan hard-soled footgear must therefore also be considered, as first suggested by Downs (1972:6). The northern origin of Southwestern moccasins has long been suspected, as Bert Salwen notes: "[t]he leather shoe did not come into general use in the Pueblos until after AD 1300. . . . The Pueblo leather footgear trait might have been borrowed from the Athabaskan invaders" (Salwen 1960:222).

Maping Vestigial Traits: the Attenuation of Complex Bows

Old-fashioned cladistic analysis of material culture and technology was concerned with the development of new adaptive features which improve on old designs. In other words, material cultural change is always conceived in terms of progress towards some ultimate human achievement. But there is no reason to expect tools to be more sophisticated than necessary, and when circumstances change, tools can become less sophisticated. To maintain unnecessary sophistication can be maladaptive.

In some ways, my present 'grand synthesis,' successful or not, is indebted to nineteenth-century scholarship, even as I seek to account for twenty-first century data. But many nineteenth-century anthropologists felt the need to place less sophisticated cultures on the bottom rung of an evolutionary ladder. Thus Henry Balfour (1890:224) saw Native American complex bows as the direct historical forerunners of Eurasian bows, rather than simply as an attenuated side-branch in the development of archery traditions. In orienting the data this way, technology is portrayed as the supreme force for change in the world, capable of overcoming any obstacle through ever-increasing 'sophistication'. I strenuously argue that the occasional failure of over-designed tools and the subsequent loss of 'sophistication' in technology over time and space are both increasingly relevant topics (although the concept of 'sophistication' is itself suspect). Yet social scientists have not fully appreciated the implications of the adaptive significance of retrograde movements within the long arc of history. It may even be the case that a loss in technological complexity is associated with an improvement in function, where circumstances are right.

Far from representing a more primitive form of the complex bow constrained in its development by the absence of glue (as Balfour and others would suggest), the form of

the complex bow found in the American (and Northeast Asian) Arctic represents a clear functional improvement on the Asian weapon through the abandonment of an unnecessary design feature. The glueless-type of composite bow is perfectly adapted to circumpolar life. Fish and animal-based glue (perfectly adapted to life in the arid Eurasian steppes) is prone to catastrophic failure in the salt-spray of a kayak during a sea-otter hunt. By having a free cable backing, one can freely adjust the tension in the truss for a variety of temperature and humidity conditions, as Hamilton argues:

> Aside from the fact that the Eskimo bow did use driftwood and sinew—or antler or even bone when driftwood was not available—its genius lay in using a free sinew back in which the tension could be readily adjusted to meet varying condi- tions of humidity. . . . When we take the Eskimo way of life and his environment into full consideration, we cannot conceive of a more successful solution of an almost impossible problem (Hamilton 1970:50).

For an illustration of a tabular 'tensioner' in the cable backing of a Siberian bow, see Figure 6-6.

It is not clear whether the 4000-year-old paleo-Eskimo complex bow bracers found by Meldgaard (1960, 1962) in the High Arctic were meant to be used with glue-type weapons or with glueless-type weapons. If it were the former, then the ecological inadequacy of bow-glue could have been a contributing factor in the eventual abandonment of pre-Dorset archery technology in the American Arctic. But given the very slight margin for error in polar subsistence strategies, a number of intervening factors may have ensued. But even as the glueless complex bow adaptation may have been ultimately absolutely necessary to establish archery firmly in the extreme north, other highly derived features of Asian complex bows were retained as aesthetic details by traditional bowyers, even when their adaptive significance had been forgotten. Not every technological trait is adaptive. The presence of vestigial siyahs (bow limb

extensions) is taken as proof of the Asian origin of the technology. In Asia, bow limb extensions serve to arrest the flight of the string promoting uniform release of tension and even flight of the projectile. In North America, these distinctive features exist only in imitation of an Asian prototype; they do not usually make contact with the string and hence generally serve no function (Bergman and McEwan 1997:158; Hamilton 1970:50). See Figure 6-7 for a detail of a vestigial siyah from a Copper Inuit bow. In this case it is the retention of a non-functional appendage in the east which has conclusively demonstrated the west-to-east transmission of the technology. Functional siyahs do occasionally appear on Arctic weapons, but the non-functional (vestigial) variety appears to be the norm. But siyahs are invariably functional wherever they occur in Inner Asian bows, indicating that the siyah technology is almost certainly Asian in origin.

The concept of the vestigial feature can help to explain other elements of my complex bow dataset. I suggest that the north-to-south transmission of complex-bow technology can be cladisticaly mapped by looking for the loss of original complexity as indicated by vestigial features. One way to do this is to look at the recent adaptation of the Tlingit to a maritime hunting lifestyle. Ethnographers have long suspected Tlingit moved from an interior to a coastal environmental adaptation withing the last 500 to 1000 years (Moss 2004:184). In the process of adapting to sea mammal hunting, they have mostly retained the self bow—Tlingit complex bows are extremely rare. Kroeber writes about the recent transfer of the Asian composite bow to North America, which seems to have bypassed the central regions of the Northwest Coast:

> Of specific traits common to the Northwest Coast and Asia, armor is the outstanding one to rise to mind. The sinew-backed bow, assuming it to be a modification of the Asiatic composite bow, extends into the Plains and

> Southwest, but is uncharacteristic of most of the Northwest Coast (Kroeber 1923:18).

Complex bows are extremely rare in southern Tlingit territory, around Sitka Alaska. This is the historical center of Tlingit society. By contrast, northern bands like the Yakutat and Inland Tlingit represent very late incursions into Athapaskan-Eyak territory, and it is among these northern Tlingit that complex bows are more common, having evidently adopted them from assimilated Eyak, Athapaskans, and Chugash Eskimos. The one Northwest Coast glueless-type bow I have seen is SDM 27257, and it is most likely Tlingit. It has functional siyahs, but it has another even more striking example of a vestigial feature; the entire southern-style backing is likely of minimally functional importance at best, because it is not made of an elastic material like sinew or conditioned babiche. It is backed using cotton thread (Figure 6-8). This bow is sharply recurved and appears to have been strung backwards. This is a feature held in common with the only other Tlingit bow I know of, from Sitka (NMNH E274444), a donation from the estate of the former governor of the Alaska territory in 1912. These two bows have very similar length, width and thickness measurements at all points, supporting the view that they come from a common cultural source. But NMNH E274444 has an additional feature suggesting that it (like SDM 27257) also possesses a vestigial cable backing; it has a D-shaped cross-section, and the backing surface of of the stave is semi-circular. This is an extremely rare feature which is not conducive to a functional backing. Murdoch writes of a similar Smithsonian Sitka Tlingit bow (now lost):

> There is one bow in the Museum, not an Eskimo bow, which is interesting in the present connection. It comes from Sitka, where the Indians use a plain Spruce or cedar bow with a round back and flat belly. The bow in question is of the same shape as the other bows from the same locality, but the maker, who has evidently had some acquaintance with the handiwork of the nearest Eskimos [or Athapaskan-Eyak speakers], has tried to improve it by

> putting on a typical "southern" backing of sinew. This, however, is of but little use, as the round back of the bow is not of the proper shape to receive it, and, in spite of the lashing round the handle, it slips off to one side as soon as the bow is bent (Murdoch 1885:315).

The single example of a Southern-Athapskan attributed Arctic-type cable-backed bow that I know of (in a private collection) also has a rounded backing surface, and the cable backing also appears to be slipping off to one side, rather ineffectively (Figure 5-14A). This feature argues persuasively for the northern origin of the bow-design in question, and for the vestigial status of the cable backing in this context. The extreme rarity of this type of bow in the south (found only in the westernmost Apachean range) could owe something to the retention of the glueless backing design feature in deference to ancestral tradition, and not due to any thorough understanding of bow engineering and performance. The glueless method of cable-backing was developed for maritime hunting contexts. It is likely vestigial in the arid Southwest, and may demonstrate retained technological knowledge in the absence of understanding of its underlying purpose. The aridity the desert Southwest is ideal for the use of the nearly ubiquitous glue-type complex bows with backing materials most similar to those of the prototypical complex bows of the arid Eurasian interior.

Now the question of the southward spread of the glue-type complex bow remains. Experimental archery has demonstrated the outright superiority, in terms of projectile velocity and range, of the double-curved Apache complex bow design over a North American self-bow of equivalent size and shape (Bergman et al. 1988). Bergman and McEwan (1997) admit the Asiatic origin of the Eskimo complex bow is irrefutable, but they suggest that “independent invention and use of the technology of sinew reinforcement among other Native American groups remain possibilities” (Bergman and

McEwan 1997:158). I suggest that the double curve shape, like the siyah, may be a vestigial feature of Central Asian bow design, at least in certain contexts. As I have earlier argued, the double curved shape originated in Central Asia during the Bronze Age (Figure 5-15), and through the Xiongnu period it was developed into various Siberian manifestations culminating in the ubiquity of complex archery in Siberia within the last 2000 years (Figure 6-9). This is on the eve of the expansion of this technology into the New World.

The double curved shape commonly occurs in self bows in the Plains and Southwest, and has even appeared in the Athapaskan Subarctic (Figure 5-14). It is my contention that this is a non-functional vestige of the recurved form of glue-type sinew backed bows. The performance characteristics of a Sioux double-curved self bow are significantly poorer than an Apache sinew backed bow of the same basic shape (Bergman et al. 1988:662-665). I contend that the double curved design of self bows was itself a vestige of complexity (like the arctic siyah), retained for aesthetic reasons and in deference to tradition. It could also be that the shape was retained because in the hands of a warrior, it could be mistaken for a superior complex bow from a distance. But there are limits to this sort of adaptation, and recurving a selfbow needlessly has the drawbacks of increasing material stresses in the wood, breaking down the cellular structure without the compensation in tensile strength provided by the sinew-backing. There is further reason to suggest that the double curved shape by itself could be maladaptive in self bows, even without accounting for the increased strain and fatigue it causes with the bowlimbs. Among those Western Apaches who lost the sinew backing technology, they continued the complicated bowlimb conditioning process to make the

double curved shape in deference to tradition, at least until someone pointed out that this was not a very practical approach. As one of Grenville Goodwin's anonymous informants states:

> We used to make our bows in two shapes, the single arc bow and the double arc bow. The double arc bow you get into that shape when it is still green. The double arc bow we had before the single arc bow. But later we learned that the single arc bow was better because there was more room to string and draw an arrow on it, there being no hump in the middle (Goodwin and Basso 1971:224).

In a precise analogy to the case of vestigial siyahs which demonstrate the Asian origin of the glueless (Eskimo) complex bow, we find prevalent knowledge of proper recurved bowmaking techniques in the absence of the understanding of the function of this technique as a complement to the complex backing principle. This is a strong indication that neither the double curved shape, nor the glue-type sinew backing method was developed independently in New World contexts. The case that it is part of the Dene-Yeniseian cultural legacy remains strong.

Final Thoughts

My project is indebted to the pioneering work of Jordan Paper (1993), who has challenged conventional wisdom regading Na-Dene origins. In his earlier synthesis of archaeology, genetics, oral tradition and material culture, Paper first connected the dots between complex archery, Dene-Central Asian language links, and Athapaskan oral traditions which explicitly claim Central Asian origins. Notably, he also raised awareness of the unique Chiricahua Apache use of Central Asian style thumb rings, whose presence implies the former prevalence of a Mongolian style arrow release (otherwise virtually absent in the New World). The nearest use of this thumb ring (found

invariably in association with complex archery) is among Neo-Siberian reindeer pastoralists in the Amur River region of Southeast Siberia. Paper writes:

> The archeological evidence suggests that Athapaskan speaking peoples did not settle in the interior of British Columbia until approximately a thousand years ago. When they arrived in this area, they and they alone were familiar with the bow and metal arrow points. Apachean speakers then, according to linguistic and ethnohistorical data, would not have remained for any length of time, but continued their journey southwards to reach their present locale approximately 600 years ago. . . . The Chiricahua migration myth accords with a Bering Strait crossing interpretation, although this is not a necessary one. That this interpretation comes from the Chiricahua themselves, however, strengthens the possibility. . . . The loss of the technologically complicated full recurve bow is not unexpected; only the Inuit maintained continued contact with Asia and hunted very large animals over long distances. Also, the use of the bow tends to disappear with the introduction of firearms. Only those cultures that did not readily have firearms available until the late eighteenth century would have fully retained their archery complex until the beginning of modem ethnology (Paper 1993:8-9).

Hair-tempered pottery, forged copper bifaces and daggers, and sinew-backed bows were standard equipment in western interior Alaska during the second millennium CE (but *not* during the first millennium), and the Athapaskans residing there used words for these tools related by common descent (rather than borrowing) to similar words for similar technologies in the far-flung peripheries of the zones of the family's phyletic expansion; often these words are found to be related to Central Asian words. Neither pottery nor sinew-backed bows have yet been found (archaeologically or ethnographically) in a vast sector of western-interior Alaska or adjacent regions of British Columbia or Yukon, a region traditionally regarded as the proto-Athapaskan homeland. Nor am I aware of any Athapaskan languages of this putative homeland region which retain the proto-Athapaskan rootwords for pottery or sinew backed bows, suggesting these terms may have been lost around the time of initial settlement.

The collective implications of the linguistic evidence, in conjunction with ethnographic and archaeological data, are unanimous in favoring a revised timeframe for the Athapaskan expansion, commencing in the second millennium CE (slightly later than is generally recognized) from an epicenter slightly to the west of where it is commonly regarded by specialists today, and rapidly resulting in a southern expansion, with the first Southwestern presence slightly earlier than most specialists would favor. The linguistic data come into focus with precision here. Consistent with the principle of Occam's razor, this model is simpler and more efficient than other scenarios for the Athapaskan migrations, and it accounts for a broader range of linguistic, ethnological and biological evidence, in addition to helping to explain the distribution of complex archery in the American West. Most of the detailed work to support this model is still in its preliminary stages, but I suggest that a paradigm shift is now underway. As Vine Deloria has written: "Samuel Eliot Morrison is now dead, and we need no longer cringe in fear that he will discredit us for believing that someone besides Columbus visited these shores" (Deloria 1992:597).

Table 6-1. Metal/Knife Terms in Proto-Athapaskan, Eyak and Eurasian Languages. Adapted from (Golla 1998) with additions from (Alderson and Iz 1959; Clauson 1972; Figueiredo 2008; Greenfeld 1973; Kari 1978; Takata 2000).

North America		
	Proto-Athapaskan	**weš^{w}*, *wəš^{w}* ‘knife, (metal, stone) for knife’ [= **meš^{w}*]
	Upper Tanana	*basr* ‘stone’
	Lower Tanana	*basr* ‘knife metal, tin’
	Ahtna	*baes* ‘stone’, *la-baes* ‘large circular stone or copper knife’
	Dena’ina	*vash-la* ‘round, woman’s knife; ulu’, *cha-vash* ‘large ulu’
	Deg Hit’an	*vaxa* ‘knife, adze, tool’, *tavasr* ‘woman’s knife, ulu’
	Carrier	*-bes* ‘knife’ (in compounds)
	Hare	*bie* ‘knife’
	Bearlake	*besči* ‘arrowhead’
	Chipewyan	*bès, bis* ‘knife’
	Slavey	*^{n}bèh* [*^{m}b*] ‘metal’
	Dogrib	*me* [*^{m}b*] ‘knife’
	Tsuu’tina	*mas* ‘knife’
	Plains Apache	*bééš* ‘metal’
	White Mountian	*beeš* ‘knife, metal’
	San Carlos	*bééš* ‘knife, metal’ (also in Chiricahua)
	Navajo	*béésh ~ beeš* ‘knife, flint, metal, iron’
Eyak		*we.gš*(*-g*) ‘ulu; woman’s scraper knife’.
Eurasia		
Samoyed		
	Enets (Yenisei)	*bese* ‘of metal’
	Nganasan (Tavgi)	*bása* ‘of metal’
	Kamas	*baza* ‘of metal’
	Nenets (Yurak)	*wese ~ yeese* ‘of metal’; *wieðe* ‘iron’
North Caucasian		
	Ubykh	*wəš^{w}a* ‘copper’
Turkic		
	Uyghur (Buddhist)	*bıçak* ‘knife’; *bıç ~ biç* ‘to cut’
	Turkish	*bıçak* ‘knife’
	Azeri	*mis* ‘copper’ (also Uyghur, Kazakh, Turkmen, Uzbek)
	Kyrgyz	*jez* ‘copper’
Sino Tibetan		
	Preclassic Tibetan	*pi-cag*, ‘knife’ (loanword from Buddhist Uyghur)
Mongolian		*mes* ‘edged tool or weapon, knife, sword’
		ǰes (*ǰed*, dialectal) ‘copper’

Table 6-2. Muskogean, Yukian and Penutian Archery Terms, adapted from Greenberg (1987:146) with additions and corrections.

Penutian			
California			
	Maidu	*nokʔo* ‘arrow’	
	Wintu	*nōt* ‘arrow’	(von Sadovszky 1996): 26)
	Yokuts (Yaudanchi)	*nukʔon* ‘bow’	
	Yokuts (Gashowu)	*nekʔ-, nukʔ* ‘bow’	
Oregon			
	Kalipuya	*enuk* ‘bow’	
Yukian	Wappo	*lúk’a* ‘bow’	(corrected from *luka*, Kimball 1992:453)
Muskogean	Proto-Muskogean	**θak* ‘arrow’	(Kimball 1992:453)
	Choctaw	*naki* ‘arrow’	(Kimball 1992:453)
	Alabama	*łaki* ‘arrow’	(corrected from *nakɨ*, Kimball 1992:453)
	Koasati	*łaki* ‘arrow’	

Table 6-3. Siberian Uralic and California Penutian Archery lexicons**.** Adapted from von Sadovszky (1996:26-27).

Siberian Uralic	California Penutian
jow-t ‘bow’ (Vogul)	*jawe* ‘bow’ (Central Sierra Miwok)
ńōl, ńōt ‘arrow’ (Vogul, Ostyak, south)	*ńōt* ‘arrow’ (Wintu)
kāli-γ ‘bowstring’ (Vogul)	*kāli* ‘bowstring’ (Patwin)
tul ‘quiver’ (Ostyak, north)	*tul-im* ‘quiver’ (Clear Lake Miwok)
pos ‘broad arrow head’ (Ostyak)	*bos* ‘arrowhead, knife, spearhead’ (Nisenan)
kesi ‘knife’ (Vogul)	*kiče* ‘knife’ (Central Sierra Miwok)

Table 6-4. Athapaskan pottery terms (Kari 1989:566; 1978:86 and Sapir 1923:253).

Proto-Athapaskan_	**ons·a’, *as·a’, *’usa:k’* ‘clay pot, kettle’
Deg Hit’an (Yukon)	*e'ço*, *eço'xû*, *e'çok*, *ethok* ‘clay pot’
Dena’ina (Lime)	**’usa:k’* ‘clay pot’
Carrier	*oṇsa* ‘kettle’
Sekani	*oṇsha* ‘kettle’
Hare	*oṇfwa* ‘kettle’
Mountain	*oṇfa,* ‘kettle’
Beaver	*ūsa’* ‘pail’
Tsuut’ina	*as·ạ’* ‘clay pot’
Navajo	*ă'sā* ‘pot, native pottery’

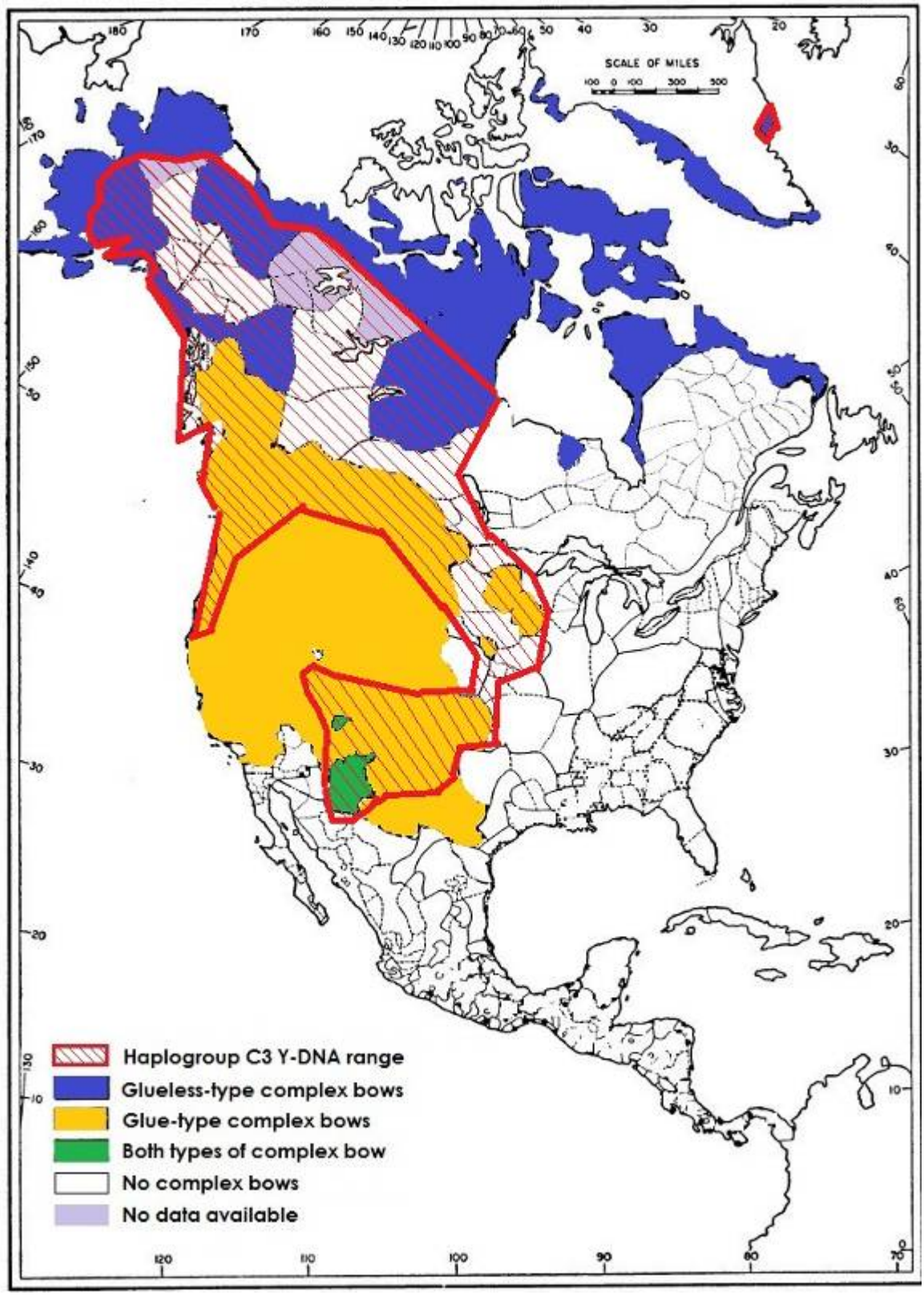


Figure 6-1. Haplogroup C3 Y-DNA distribution overlaid with complex archery distribution.

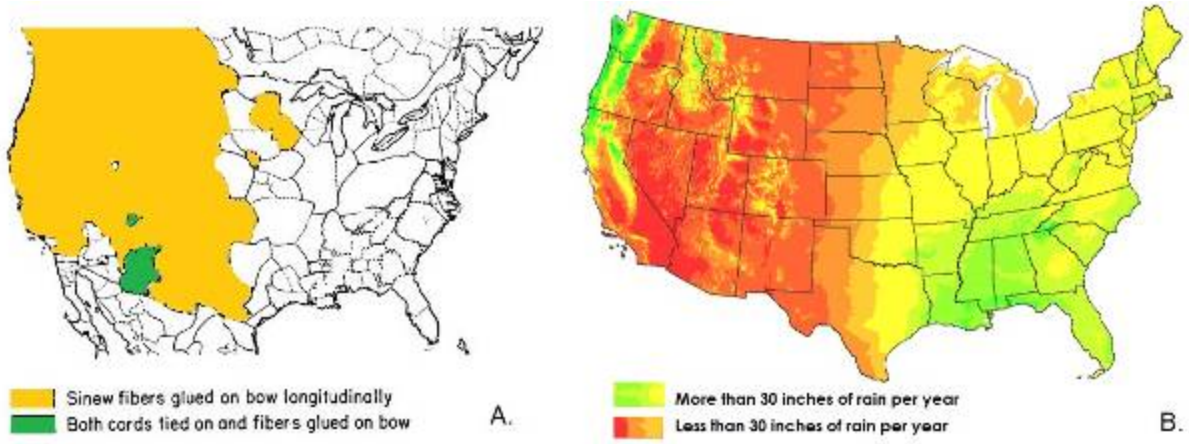


Figure 6-2. Comparison of complex bow distribution in the contiguous 48 states with mean annual precipitation.

Figure 6-3. Comparison of Tlingit and Scythian scale armor. A) Tarku Inland Tlingit-Athapaskan scale armor using Chinese coins (Laufer 1914: pl. 13). B.) Scythian leather scale armor, sixth century BCE. Courtesy of the Metropolitan Museum of Art, New York.

Figure 6-4. Estimated chronology for the adoption of the bow in North America (Blitz 1988); © 1988 Baywood Publishing Company, used by permission.


A.


B.

Figure 6-5. Comparison of Tsuut'ina and Alaskan flat-bottomed pottery vessels. A). Crude model of Tsuut'ina hair-tempered pottery pail, made by wife of Two Guns (Sapir 1923:250). B). Yupik Eskimo pot collected by E.W. Nelson in the late nineteenth-century (Holmes 1910:298).

Figure 6-6. JES 2649; Detail of tensioner (cable tension adjuster), late nineteenth-century Yuit hide cable-backed bow, East Cape, Siberia. Photo by author. Courtesy of the San Diego Museum of Man.

Figure 6-7. MPM 33610; detail of vestigial siyah on Copper Inuit bow. Note the lack of contact between the limb-tip extenston and the bow string. Photo by author. Courtesy of the Milwaukee Public Museum.

Figure 6-8. SDM 27257; detail of cotton cable backing near the siyah of a likely Tlingit bow. Photo by author. Courtesy of the San Diego Museum of Man.

Figure 6-9. Yukaghir composite bow, Northeast Siberia (Jochelson 1910:383).

Figure 6-10. GMA 7336.284; Apache double-curved self bow. Photo by author. Courtesy of the Gilcrease Museum of the Americas.

APPENDIX A
INTERNAL CLASSIFICATION OF THE ATHAPASKAN LANGUAGES

(Adapted from Hoijer 1971; Jacobs 1937; Krauss & Golla 1981; Whistler 1979; Pierce and Ryherd 1964; Shipley 1978). The numbering scheme approximates subdivisions based on mutual intelligibility. Symbol "←→" indicates dialect-like mutual intelligibility between units which are often classified as separate languages. Forward slash "/" indicates alternate names for one group; dash "-" between true dialects of one language.

I. Northern Athapaskan (Alaska, western Canada). The number of Northern Athapaskan languages is difficult to determine because language boundaries are generally 'soft' with some degree of mutual intelligibility. There are probably 20 to 30 languages; the imprecise number reflects more or less constant intergroup communication.

1) Dena'ina
2) Ahtna
3) Deg Hit'an/Ingalik ←→ Holikachuk/Innoko ←→Koyukon
4) Upper Tanana ←→Tanacross/Nabesna ←→Lower Tanana ←→ Upper Kuskokwim/Kolchan; Upper Kuskokwim also has some notable linguistic affinities with (1) and (2), and is geographically and culturally linked to (3).
5) Tutchone; northern and southern dialects sometimes classed as separate languages.
6) Gwich'in; with eastern and western dialects.
7) Han; closely related to (6). Han speakers often understand (6), but not the reverse.
8) Tahltan ←→ Kaska ←→ Tagish; (Tahltan + Kaska = "Nahanni").
9) Tsetstaut; poorly documented intermediary between (8) and (10).
10) Sekani ←→ Beaver/Dunneza ←→ Tsuu'tina/Sarsi
11) Chipewyan; includes Yellowknife dialect and Chipewyan proper.
12) Slavey ←→ Bearlake ←→ Mountain ←→ Hare
13) Dogrib
14) Carrier/Dakelh ←→ Babine/North Carrier
15) Chilcotin ←→ Nicola; relatives of (14).

Some of these languages/dialects have been further grouped into larger genetic sub-families (i.e. family-tree branches) by various scholars, but these groupings are somewhat arbitrary as they depend on which particular features are compared—a heterogeneous patchwork of innovations makes for multiple distinct overlapping zones of affiliation. Proposed subgroups include the following:

A) Tanana-Slavey-Chipewyan (Hoijer 1963)
B) Tanana-Koyukon (Dumond 1969)
C) Tannacross-Tutchone (Hoijer 1963)
D) Deg Hit'an-Gwich'in-Han (Hoijer 1963)
E) Ahtna-Tahltan-Kaska-Sekani-Tsuut'ina-Beaver (Hoijer 1963)

F) Hare-Dogrib (Hoijer 1963)
G) “Northeastern Athapaskan”: Mountian-Hare-Bearlake-Slavey-Dogrib-Chipewyan (Howren 1975)
H) “Canadian Athapaskan”: all Athapaskan languages of Canada, plus Gwich’in, Han, and Upper Tanana straddling the Alaska border (Dumond 1969).

II. Pacific Coast Athapaskan (Washington, Oregon, California).

A) Kwalhioqua-Clatskanie-Owilapsh (Columbia basin, Washington and Oregon).

Whistler (1979:14) writes: “perhaps one language with 3 dialects . . . considered either as a (geographical) part of Pacific Coast Athapaskan or as a (linguistic) intermediate between Pacific Coast Athapaskan and Northern Athapaskan.” Nicola Athapaskan, a central Plateau dialect of Chilcotin located in southern British Columbia, is discontinuous with the rest of the northern bloc, and geographically intermediate between Kwalhioqua-Clatskanie-Owilapsh and Chilcotin. Nicola might also be an intermediary with KCO, e.g. Chilcotin ←→ Nicola ←→ KCO; however Nicola and KCO are both too poorly documented to be certain of this. Some specialists classify KCO as its own independent Athapaskan division, rather than as a subdivision of PCA.

B) Oregon Athapaskan (Southern Oregon-Northern California)
1) Upper Umpqua [probably one language; dialect relationships unknown]
2) “Rogue River”; several languages, probably connected by a dialect continuum: Coquille←→Tututni ←→ Chastacosta-Chetco-Tolowa ←→Galice-Applegate

C) California Athapaskan
1) Hupa-Chilula-Whilkut [one language, three dialects]
2) Mattole ←→ Wailaki-Nongatl-Lassik-Sinkyone-Cahto [2 languages, probably connected by a dialect continuum]

III. Southern Athapaskan (Apachean). Two languages. Some mutual intelligibility between Apachean dialects and Canadian Athapaskan languages (e.g. Chipewyan, Tsuut’ina) suggests that the Apachean languages are still on the precipice of linguistic differentiation with those of the north, i.e. they are practically still dialects of Canadian Athapaskan. This general similarity makes it very difficult to determine which Canadian group is genetically closest to Apachean, or where the geographical divergence began. At the time of initial separation, it is unlikely that there was significant differentiation between the southernmost Canadian languages.

1) Plains Apache/Kiowa Apache
2) Southwestern Apachean [one language, six closely related dialects: Navajo; San Carlos; Chiricahua; Mescalero; Jicarilla; Lipan].

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BIOGRAPHICAL SKETCH

Joseph A.P. Wilson became interested in Athapaskan communities in 1997 during a six-month stint as a conservation aide with the National Park Service near the Navajo Reservation in Arizona. He earned a Bachelor of Science from Kent State University, in Ohio, Summa cum Laude, with Phi Beta Kappa and University Honors in anthropology and religious studies. Joe studied abroad at the University of Leicester, and the University of London, School of Oriental and African Studies, where he earned a Master of Arts in Oriental and African Religions in 2002. His London thesis addresses the similarity between Navajo ceremonialism and medieval Vajrayana Buddhism. After returning to the US, he earned a Master of Science in Industrial Archaeology at Michigan Technological University in 2004, with a thesis addressing the history and archaeology of a small Michigan copper mine. While at Michigan he met and married fellow graduate student Michelle D. Trim. They moved to South Carolina where Joseph worked as a genetic technologist at Greenwood Genetic Center and taught at Lander University until 2007, when he began his doctoral studies at the University of Florida. He finished his Ph.D. and graduated from the University of Florida in 2011. Joe and Michelle have two sons: Oscar, born in 2009 and Arthur, born in 2011.