


## Article

# Late Holocene Technology Words in Proto-Athabaskan: Implications for Dene-Yeniseian Culture History

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**Abstract:** This study will review previously published Proto-Athabaskan (P-A) linguistic reconstructions related to weapons and ceramics technologies present on both sides of the Bering Strait. Na-Dene (N-D) is a large family of indigenous languages of North America, consisting mostly of the Athabaskan languages of the western interior, plus the Eyak and Tlingit languages of the southern Alaska coast. Athabaskan-Eyak (A-E) constitutes a distinct branch of Na-Dene. Dene-Yeniseian (D-Y) is a proposed transpacific family comprised of Na-Dene in addition to the Yeniseian languages of Siberia. Reconstructions pertaining to several specific technologies will be discussed in relation to likely cognates within broader A-E, N-D and D-Y historical contexts. Although D-Y is sometimes assumed to have originated near the conclusion of the Pleistocene Epoch (prior to ~11,500 years BP), this study will refocus fundamental questions on the current Holocene Epoch (after ~11,500 BP), and particularly the Late Holocene (after ~3000 BP).

**Keywords:** Athabaskan; Dene-Yeniseian; historical linguistics; sinew-backed bows; low-fire ceramics; copper metallurgy; migration; diffusion; Holocene



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## 1. Introduction

The present study will survey important issues in the history of language and culture at the North Pacific crossroads between the North American and Asian continents. A century has passed since Alfredo Trombetti first suggested a possible genetic relationship between members of the Na-Dene (N-D) language family of western North America and members of the Yeniseian language family of Central Asia [1]. In the last quarter century, this suggestion has emerged from the realm of fanciful speculation and has been increasingly substantiated by the work of specialists [2,3]. The favorable response of peers to the pathbreaking work of Edward Vajda in the last fifteen years has done more than anything to vindicate the proposal and build the foundations of a consensus [4,5]. It is now robustly defensible to say that there was once an ancient historical continuum between peoples of subarctic Asia and subarctic North America, despite a chasm of several thousand miles existing between the relevant present-day language communities.

If scholarship continues to bolster this proposed transpacific phylum, the Dene-Yeniseian (D-Y) language family will constitute the largest pedestrian language spread on earth. This raises questions about the cultural-historical circumstances resulting in this vast distribution. When was the last period of contact between the Asian and American relatives? Where precisely within this vast territory did the common ancestors of both groups reside? Several distinct Yeniseian languages (including Yugh and Kott, among others) survived until circa 1750–1850 CE, but the Ket people (in western Siberia) are the sole surviving Asian D-Y language group today, representing an extreme geographic outlier with respect to the majority of N-D languages. The enormous bulk of the family today is represented by the Athabaskan division, which could possess a slightly greater phylogenetic affinity with Yeniseian than with Tlingit [6]. If it is proven that the deepest D-Y dialect cleavage is between Athabaskan-Eyak (A-E) and Tlingit (i.e., between the two main North American branches), this could be compatible with a proposed Beringian origin of the family as a

whole, and with the hypothesis of an ancient reflux-migration of early Na-Dene speakers from Alaska to the vicinity of the Yenisei River [7–9].

Alternatively, the ancient D-Y hearth could have been located in a more intermediate part of subarctic Siberia and would therefore have been subject to language replacement via the expansion of the various Neo-Siberian languages during the Holocene Epoch (after ~11,500 BP). If so, then the different depths of linguistic differentiation between N-D and D-Y branches might be explained by more complex and nuanced demographic models. For example, if either of the North Pacific Coastal Na-Dene peoples (e.g., Tlingit or Eyak) had already anciently diverged from an undifferentiated subarctic/interior branch (including ancestral A-E + Yeniseian), the location of the N-D *Urheimat* (De. “original linguistic homeland”) in North America could not be presumed. An Asian origin of the D-Y family is compatible with older archaeological views of a west-to-east acculturation gradient in the North Pacific during the last several thousand years [10,11]. Also supporting this scenario is the work of Pavel Flegontov and colleagues suggesting mid-Holocene admixture between Asian and American populations, which has contributed substantially to N-D ancestry [12].

To help clarify this situation, the present study will survey several key lexical reconstructions of technology terms in the reconstructed Proto-Athabaskan (P-A) language and discuss them in the context of Athabaskan cultural history. The P-A technological lexicon must be linked to real material culture, i.e., physical objects in archaeological and ethnological contexts. Beginning in the mid-20th century, North American anthropologists moved away from the traditional social scientific view of language and culture as purely mental phenomena (in contrast with inert technological artifacts) and increasingly embraced the study of technology as inextricably entwined with language and culture [13,14]. Technology is not merely a collection of static ‘things’ but a set of practices embedded within—and constructed by—social processes mediated through language [15] (pp. 83–84). In turn, the materiality of such technological processes yields short-term and long-term sociocultural consequences [16].

Recent work integrating historical linguistics and archaeology has led (for example) to a strengthening of the hypotheses surrounding Indo-European (I-E) cultural origins in the early Bronze Age of the Eurasian Steppes. Archaeologist David Anthony has demonstrated that Proto-I-E words for animal-drawn wheeled vehicular technologies (and associated technologies related to animal husbandry) can be mapped on the material cultural record, narrowing the temporal and geographic context of I-E origins considerably [17]. In discussing the correlation between language and material culture in Papua New Guinea, C.C. Moore and A.K. Romney note a general anthropological principle that ethno-linguistic groups “are assumed to share a number of common linguistic and cultural elements, including material culture elements in the archeological record” [18] (p. 388). A classic example is the Uto-Aztecan (U-A) lexicon for maize agriculture and an associated constellation of planting and grain-processing technologies. The far-flung U-A descendant peoples each preserve elements of this lexicon and the material cultural corollaries, which can be traced directly to archaeological patterns in the Southwestern U.S.A., thus confirming the traditional location of the U-A *Urheimat* [19].

Archaeological and historical evidence for continuity between specific technological traditions on both sides of the Bering Strait can illuminate when precisely an Asian-American D-Y cultural continuum was flourishing. Vajda’s pioneering work suggests that the original D-Y languages must have been located in the subarctic taiga forests because the preponderance of lexical cognates (of natural and cultural items) reflect well-known subarctic subsistence patterns [20]. Vajda currently favors a mid-Holocene age range (~5000–7000 years BP) for the roots of the D-Y family as a whole [21]. If he is correct, D-Y is no exception to the observed chronological scales of other major Eurasian language families, such as I-E and Sino-Tibetan (S-T).

Following the influential work of Michael Krauss and Victor Golla [22], the location of the P-A *Urheimat* is customarily situated near the Yukon-Alaska borderlands, near enough

the zone of greatest Na-Dene language diversity to be plausible, and yet sufficiently distant from the periphery of the Athabaskan spread zone to account for the paucity of extrafamilial Yupik loanwords in the proto-language. The present study shows that this traditional model is probably mistaken because several key P-A technological terms of demonstrably Late Holocene antiquity must have originated considerably west of this spread zone. The lexemes themselves and the technologies they describe are conspicuously absent in ancient southeastern Alaska and western Yukon Territory [23]. Thus, southwestern Alaska, as the beachhead for Siberian technological and cultural diffusion, is the most plausible candidate region where all the requisite toolmaking traditions proliferated during the same interval in late prehistory [24,25]. This would account for a more transparent derivation of related terms in far-flung daughter languages, albeit one that does not conform to the expectation of a very long duration in the Yukon region. Furthermore, a more westerly Alaskan homeland for the P-A speech community better conforms to the conventional practice of placing the *Urheimat* nearest to the zone of greatest divergence between sibling languages [26].

During my previous research in Athabaskan ethnographic collections undertaken at a dozen major museums in North America, I became aware that several distinctive Late Holocene Siberian technological traditions (including complex archery tools, low-fire ceramics, and hot-forged metal objects) were associated with disparate Athabaskan-speaking communities separated by vast distances. The fact that these tools were most often referred to using cognate Athabaskan terminology was striking [27]. So, the choice to examine archery, ceramics and metal words in this study is not *ad hoc*, but driven by direct observation of ethnolinguistic patterns in the distribution of these technologies at the continental scale, confirming similar suggestions by earlier scholars [23]. Comparison of Athabaskan words for these particular technologies closely dovetails with robust archaeological and ethnographic data to suggest a later and more rapid dispersal of Athabaskan languages than is commonly assumed. The complex archery tools themselves (sinew-backed bows and accessories), along with hot-forged copper blades and low-fire organic-temper ceramics, all first appeared in interior western Alaska during the same narrow window of time, considerably less than ~2500 years BP [27].

All three categories of reconstructed words (archery tools, clay dishes and metals) have suggestive parallels in Eurasia, either among Yeniseian speakers or among their near-neighbors currently residing in regions where Yeniseian languages were likely spoken in later antiquity [2,20,27,28]. Given the clear west-to-east gradient of technological change over time within this spread zone, the cultural-historical implications of these parallels are flatly inconsistent with the proposed reflux-migration of Yeniseian languages from America to Asia proposed by Mark A. Sicoli and Gary Holton [6]. Their data might better be explained as an effect of a recent and rapid differentiation of the N-D phylogeny, which explains the lack of deep differentiation between D-Y daughter clades in their Bayesian models, and also neatly accounts for the apparent lack of extrafamilial influences on the Athabaskan protolanguage. The striking lack of Yupik loanwords in the P-A language prompted Krauss and Golla to shift the homeland far away to the Yukon territory (sheltered from Yupik influence) [22], but a rapidly expanding language family would likely fail to uniformly gather loanwords from passers-by. These proposed revisions to the standard model of Athabaskan origins also can help bring the antiquity of the proposed D-Y relationship well within the conventional ~6000–10,000-year upper age limit for major language phyla, in agreement with Vajda's recent work [21,29].

## 2. Vajda's Proposed Mid-Holocene D-Y Technology Words

The present study will not attempt to review the state of D-Y linguistics as a whole but will examine a modest sample of key lexical items relevant to technological changes occurring in western Alaska during the Late Holocene. The rigorous work of Edward Vajda has laudably brought D-Y studies to the forefront of historical linguistics. Vajda wrote concerning the antiquity of the D-Y technological lexicon: "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 [...] Predictably, the cognates do not include words for technologies of Late Holocene acquisition, such as the bow and arrow” [20] (p. 102). Vajda’s pioneering 2010 study presented several examples of post-Pleistocene technology words (referring to tools used well prior to the Late Holocene), a few of which are presented in Table 1. (For a complete list of the P-A technology words referenced in this paper, see Appendix A).

**Table 1.** Selection of Vajda’s exemplars of P-A technology words and their D-Y cognates [20].

Definition	P-A Root	Yeniseian (Language)
sled runner	*ka’n	uín ~ uín, (Ket)
Canoe	*č’wix [30]	tij (Ket/Yugh)
hook (n.)	*šw əχ-ł [31]	*sukl (Ket) sù:ł (Yugh)

Vajda’s proposed cognates are more stringently vetted than those proposed by earlier proponents of D-Y language links (including the spearheading work of Merritt Ruhlen [2]). Vajda’s work is buttressed by robust morphological and grammatical parallels, seeking to avoid the pitfalls of alluring coincidental lookalike/soundalike resemblances. For example, the P-A and Yeniseian nouns for “hook” (in Table 1) are derived from cognate adjectives meaning “hook shaped”, which are then modified by the addition of the shared D-Y instrumental suffix -ł in both Athabaskan and Yeniseian contexts [20]. It is precisely this level of rigor that has caused even skeptical peers to acknowledge that the D-Y relationship must have some historical basis [4].

Vajda’s healthy skepticism about the possibility of Late Holocene D-Y technology words is understandable, given that the archaic Beringian roots of the N-D is a virtual axiom in American anthropology [32,33]. There may be cause to question Vajda’s conclusions, based on a number of solid reconstructions of Late Holocene technology words in P-A and the relationship of these technologies to archaeologically attested late prehistoric networks of exchange between northeast Asia and North America [25].

### 3. Comparison and Discussion of the Late Holocene P-A Technological Lexicon

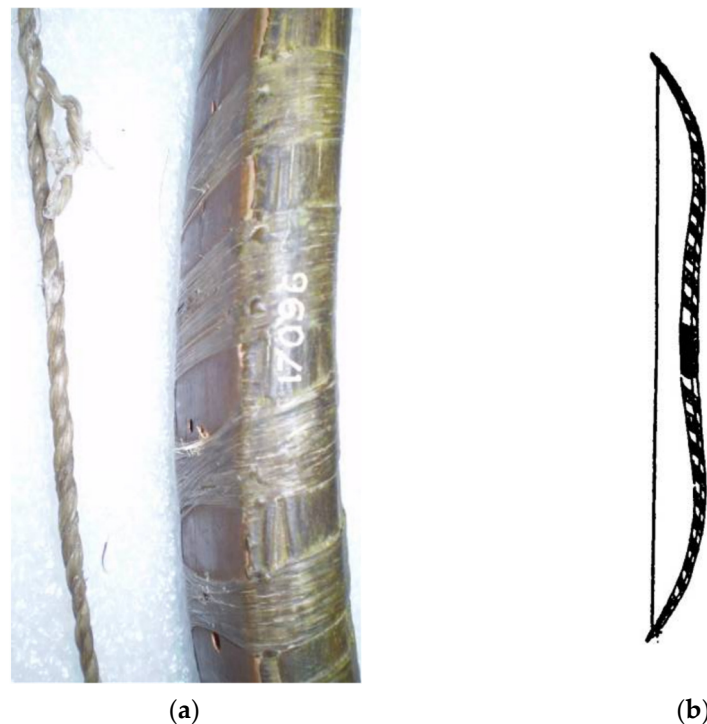
Particularly relevant to this study are P-A terms \*ts’əl-təŋ? “sinew-backed bow” [27]; \*-q’a? “arrow” [2]; \*q’ā-zə’s “quiver” [31]; \*weš<sup>w</sup>, \*wəš<sup>w</sup>, \*meš<sup>w</sup> “metal, knife” [28]; \*ons’a’, \*as’a’, \*usa:k’ “clay pot” [26,34] and \*t’s’a’k’ “bowl, dish” [2]. Each of these key examples merits a detailed discussion below.

#### 3.1. Sinew-Backed Bows

Reinforced sinew-backed bows are distinct from simple bows in that they use longitudinally applied animal sinews to provide extra strength and ductility to the back of the weapon. These bows are an advanced Eurasian archery technology that was introduced to far northern North America via northeast Asia on at least two separate occasions. The oldest archaeological evidence of the sinew-backed bow in North America was found in the eastern high Canadian Arctic, circa 3900 years BP, and is associated with the early Saqqaq maritime hunters [35]. The weapon did not initially prove practical in a maritime hunting context, and it disappeared from the archaeological record for approximately 2000 years. It was reintroduced to Alaska in the late first millennium CE and was initially associated with a cluster of advanced military technologies (e.g., wrist guards and particular armor types) collectively referred to as the “Asian War Complex” [36].

The P-A word for “sinew-backed bow”, \*ts’əl-təŋ? [27,37], is derived from words in all three major Athabaskan geographic blocs (North, South, Pacific), e.g., Deg Hit’an gił-təŋ?, Dena’ina cīł-den, Gwich’in k’ił-tai?, Hupa ts’ił-tiŋ?, Chipewyan ʔił-tin, and Navajo ʔál-tin? [37–41]. I have closely examined more than 100 sinew-backed bows in museum ethnographic collections spanning the northern, southern and western limits of the Athabaskan spread zone. Both Canadian Athabaskans and Southern Athabaskans uniquely possessed

both northern (“trussed”) and southern (“glued”) types of sinew-backed bows, indicating major north-to-south movements of these technological subtypes commenced rapidly after the North American adoption of this Asiatic technology [23] (p. 355). Furthermore, I have observed a characteristically Southern Athabaskan sinew reinforcement design where the outermost layer of sinew is applied in a diagonal spiral pattern resembling a barber’s pole. Among surviving examples, I believe this design is characteristic of Southern Athabaskan manufacture [27] (p. 217). The same distinctive technique is also documented in a lost weapon of Northern Athabaskan manufacture, depicted in A.G. Morice’s 1894 ethnographic sketch of a Tse’khene sinew-reinforced bow from central British Columbia [42] (p. 58) (See Figure 1). It can be inferred that the Tse’khene had reputations as expert bowyers, as this is indicated by their designation as the “Strong Bow Indians” by the 18th-century Anglo-American explorer Peter Pond [43].



**Figure 1.** Illustration of Northern and Southern Athabaskan “barber-pole” spiral sinew reinforcement patterns: (a) FMNH 17096. Apache double-curved sinew-backed bow; detail of bow-grip. Photo by author. Courtesy of the Field Museum of Natural History. (b) Double-curved Tse’khene sinew-backed bow, central British Columbia. Drawing by A.G. Morice [42] (p. 58).

Athabaskan sinew-backed bow technology is a conundrum for anthropologists who hold the traditional view that the Athabaskan migrations in North America occurred slowly and gradually over several thousand years. The Late Holocene arrival of the weapons themselves does not conform to this model. The diffusion of exotic new technologies into existing language families cannot explain the transparent derivation of closely related words from roots conforming to the ancestral patterns of each particular dialect. The diffusion of exotic technological paradigms in existing ethnolinguistic landscapes is instead characterized by the spread of foreign loanwords or by the appearance of particular local neologisms [44]. In Athabaskan languages, we do not encounter a haphazard array of loanwords and/or neologisms for archery tools, indicating recent technological diffusion, as is characteristic of Late Holocene technologies among most American Indian language groups. The names for these weapons all descend from P-A, indicating migration with retention rather than more recent borrowing. The strong physical resemblance of the

weapons themselves in vastly different Athabaskan culture areas also supports migration with retention rather than dependence on non-Athabaskan intermediaries [27].

The Deg Hit'an example cited above is a possible loanword from Gwich'in, and this is the proverbial "exception which proves the rule." These complex archery weapons are virtually absent in the heartland of the northern spread zone (eastern Alaska and Yukon Territory) [23] (p. 355). There is less evidence of prehistoric warfare there, and the complex weapons themselves are difficult to manufacture. Simple bows (lacking sinew-backing) are easier to manufacture than complex ones and predominate where high-quality stave-wood is readily available, i.e., in the more heavily forested subarctic interior. Sinew backing is somewhat more common in treeless deserts, arctic tundra and prairies (where composite elements counteract raw material deficiencies) and in the more war-prone Pacific Coast and Southwest culture areas (where the strength and compactness of the complex weapon design provide distinct advantages in combat). Cornelius Osgood gives gił-ten' as the Deg Hit'an word for "bow", but only the second element in the compound ("—handle") was intelligible to his informant [40] (p. 201–202). The first element referring to the sinew 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": gił-ten' aθeχen, describing a "tied" northern-type or "trussed" bow. But the P-A root word for the compound gił-ten' already means "sinew-backed bow"; the Deg Hit'an speakers had forgotten the meaning of the element gił and thus added a redundant modifier to the term. Thus the technical etymological meaning of gił-ten' aθeχen is "sinew-backed-sinew-backed bow". I asked Victor Golla about this redundancy, and 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'" [45]. Where the technology did not exist in antiquity, the word also did not exist. Later technological diffusion in the Yukon drainage region resulted in an endo-borrowing of a P-A-derived root back into a speech community where the complex bow itself was a weapon of a much rarer type and where the cultural distinction between the two bow types was, therefore, less significant.

### 3.2. Arrows and Quivers

The sinew-backed bow represents a specialized archery weapon in western North America as a whole, and it post-dates the arrival of simpler archery tools (which were also introduced from Asia) by several centuries in many areas. In subarctic Alaska, the introduction of the "simple" self-bow (and archery in general) is not demonstrated much earlier than the specialized forms discussed at length above [46]. In other words, archery, in general, constitutes a Late Holocene technological complex in the northwestern N-D heartland and presents similar chronological problems for understanding the history of the Athabaskan languages. Although the "sinew-backed bow"-word in P-A has no obvious Eurasian parallels, some other archery-related terms have plausible cognate forms in the various Yeniseian languages, raising the distinct possibility that the D-Y cultural continuum spanned both continents during much later prehistory.

The relevant P-A terms are \*-q'a? ~ \*q'ā? "arrow" [2,21], \*q'ā'-zə's "quiver" [31], and \*t'əq' "to shoot (an arrow)" [5]. Vajda reconstructs the Proto-Na-Dene (P-N-D) form as ~\*qajm, "arrow" (which closely resembles his P-Y form \*qajm, "arrow") [21] (p. 375). (Note that Vajda's N-D reconstruction here is informed entirely by Athabaskan; there are no attested Eyak or Tlingit cognates). Merritt Ruhlen compared P-A \*-q'a? "arrow" and \*q'ā'-zə's "quiver" to Proto-Yeniseian (P-Y) \*qi?j, "bow" [2] (p. 13995). Ruhlen lists Ket qi?t, Yugh qi?t ' Koyukon q'o?, Chipewyan k'a, Hupa -q'a?, Mattole k'a?, and Navajo k'ā?. This etymology is one of Ruhlen's key examples illustrating the shift of a glottal stop from a position before the vowel in Athabaskan to a position after the vowel in Yeniseian. Ruhlen noted: "the different location of the glottal stop in Yeniseian and Na-Dene is not an idiosyncratic feature of the particular word ... but is rather a recurrent sound correspondence" [2] (p. 13994). (Ruhlen's set of words demonstrating this regular sound correspondence also

includes P-A \*t<sup>s</sup>a'k'/P-Y \*siʔk “bowl, dish”). Vajda proposes a relevant comparison of the verb “to shoot (an arrow)”, P-A \*t'əq', which is a plausible cognate with P-Y \*däq [5] (p. 81).

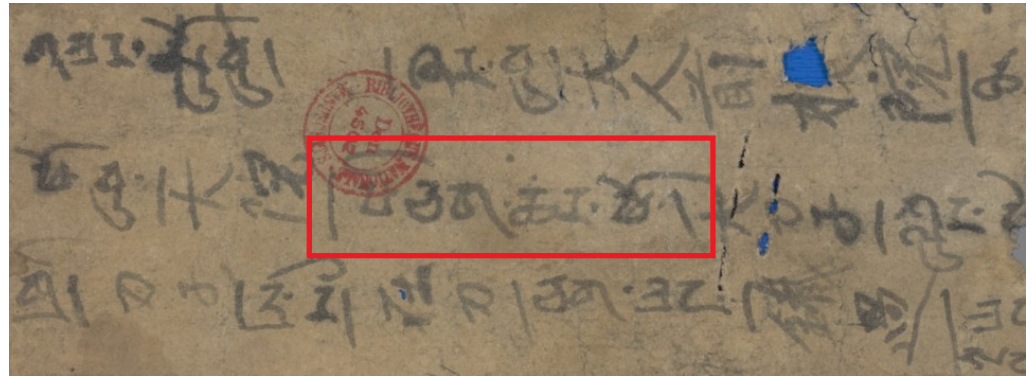
Other relevant data come from the discipline of folkloristics. The proto-Athabaskan “Slayer of Monsters” story cycle includes narrative elements widely attested in Northern and Southern Athabaskan mythology. The titular “Slayer” is the heroic protagonist (who may be partnered with a younger brother) on a quest to slay three giant cannibalistic monsters (Eagle-Monster, Bull-Monster and Mountain-Ogre) [47]. The individual stories are widespread in Asia and North America. The Northern and Southern Athabaskan variants are distinctive in that they often occur in two or three sequentially linked episodes involving the same heroic protagonist, unlike other Native American variants of the same motifs, which seldom-if-ever link the stories sequentially outside of contexts where direct Athabaskan influence appears likely. Also distinctive to the Athabaskan versions (within North America) is the protagonist’s explicit motivation to manufacture arrows (i.e., archery tools) using the feathers and sinews obtained from Eagle-Monster and Bull-Monster, respectively [48]. There is a Ket version of the Eagle Slayer episode, which shares numerous narrative details with the similar Athabaskan episode (including the hero’s reward of a weapon) [49]. The name of the Eagle-Monster in Ket mythology (dàx) is cognate with N-D words for “eagle” (e.g., Tlingit č'á'k', “bald eagle” and Upper Tanana tθ'ak, “osprey, fish eagle”) [5] (p. 72). Furthermore, there are neo-Siberian (Chelkan and Buryat) versions of the Slayer cycle of stories which are even closer to the proposed P-A narrative pattern than the Ket example. These stories also prominently feature the use of archery tools and a single protagonist battling three zoomorphic monster enemies in one narrative sequence [50] (p. 79). The particular Neo-Siberian “Slayer of Monsters” stories are found in the Altai region of Siberia, where a Yeniseian cultural substrate very likely exists [51].

### 3.3. Metal Knives

The word for “metal” and “knife” in P-A is \*weš<sup>w</sup>, \*wəš<sup>w</sup>, \*meš<sup>w</sup> [28]. Victor Golla has persuasively argued for a trans-Eurasian Wanderwort for metal/knife appearing in Late Holocene North America. This loanword appears in many American Indian languages (including several major proto-languages, although not in any known Eskimo-Aleut languages). Nevertheless, it has special significance in P-A and Eyak. In all non-N-D Native American proto-languages, the loanword exclusively refers to a metal itself (e.g., Proto-Siouan \*(a)wə.z(e) “iron”) or to a particular color of a metal (e.g., Proto-Algonquian \*wesa:w- “yellow” (initial)). In contrast, P-A \*weš<sup>w</sup>, \*wəš<sup>w</sup>, \*meš<sup>w</sup> “knife” and Eyak we.gš(-g) “ulu; woman’s knife”, both refer not merely to the raw material or the color, but to the finished metal edge-tool itself. This strongly suggests that the P-A language was undifferentiated at the time when metal knives first proliferated in interior Alaska, approximately at the same time that pottery and archery weapons first penetrated the interior. According to Golla, this “knife” form of the root word must have 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. which took place sometime well after their geographical and linguistic diversification had already commenced [52].

The P-A and Eyak forms appear quite similar to a group of Inner Asian examples of the same loanword, including notably several languages presently residing in close proximity to the alleged P-Y *Urheimat* in Siberia, i.e., the swath of land between Yenisei River, Altai Mountains and northern Mongolia. For example, see Mongolian mes “edged tool or weapon, knife, sword”, and several Samoyedic examples, including Nenets wese “iron”. Other interesting examples are found among so-called Dene-Caucasian (D-C) languages. D-C is an earlier proposal for an ancient macro-phylum that allegedly subsumes D-Y alongside Sino-Tibetan (S-T) and other major languages [53]. Golla’s single North Caucasian example, Ubykh wəš<sup>w</sup>a “copper”, is very close to the P-A form. Conservative linguists remain skeptical of the D-C phylum for many reasons, not the least is justified incredulity about the alleged Pleistocene roots of the family. One proposed remedy is that some apparent D-C cognates may indeed be genuine but might not be genetic in the strict sense.

Wolfgang Behr suggested that D-C lists are mostly loanwords that traveled via cultural and technological diffusion processes after the Bronze Age [54] (pp. 175–176). One demonstrable case of such borrowing is an S-T example of our Wanderwort attested in a Dunhuang glossary of Preclassical Tibetan (Pelliot Tibetan fragment 1260) as pi-cag, “knife”, which is clearly borrowed from Turkic, via Buddhist Uyghur bıçak “knife”; bıç “to cut”, probably mediated by a Northwestern Chinese dialect [55] (pl.1) [56] (p. 293), illustrated in Figure 2. Vajda notes a proto-Turkic form, \*mis, “copper”, and proto-Uralic, \*wäškä. But most crucially, Vajda has recently identified some relevant Yeniseian words:



**Figure 2.** Detail of a 9th or 10th-century Preclassical Tibetan glossary fragment (with Northwestern Chinese translations), Pelliot Tibetan manuscript 1260, Collected by Paul Pelliot at the Dunhuang “Library Cave” (Cave 17), 1906–1908. The indicated Tibetan text (in U-Chen script) reads pi-cag chan-pho, “big knife”, i.e., “sword”. Chan-pho is a dialect variant of the more common Classical Tibetan form, chen-po, “great”. Paris, Bibliothèque nationale de France. Available online: <https://gallica.bnf.fr/ark:/12148/btv1b8307381g.r=Pelliot%20tib%C3%A9tain%201260> (Public Domain Mark 1.0; accessed on 19 June 2023).

Yeniseian does contain reflexes of what appears to be the same Wanderwort (Ket ē-y “iron”, Pumpokol ag “iron”), which may or may not reflect the inheritance of a word already borrowed into ancestral Dene-Yeniseian. Even if one views the spread of these various words for copper, metal, or knife as arising exclusively through language contact (the Yeniseian terms could conceivably have been borrowed independently from early Uralic), their presence in the Dene languages and Eyak still supports a mid-Holocene Asian origin for Proto-NaDene itself [21] (p. 468).

Athabaskans and Eyak, after circa 900–1200 CE, practiced the most advanced hot-forged metallurgical crafts found anywhere in the prehistoric North American archaeological record and were likely spurred by the technologies of the Siberian metal age [57,58]. Athabaskans established themselves in formerly Cree territory as manufacturers and traders of edge-hardened copper knives. The earliest recorded Athabaskan oral traditions, given by Alexander Mackenzie’s 18th-century Chipewyan informants, specifically mentioned Chipewyan ancestors having emigrated from Asia in a time of warfare, crossing the ocean and settling on American rivers where copper could be panned [59] (v.1, p.clxxiii, v.2, p. 353). Double-spiraled pommels of Athabaskan metal daggers closely resemble the forms of Inner Asian daggers [60] (p. 182). The same type has also been found in the early Iron Age Siberian Tagar complex, proposed as representing the first northward expansion of Yeniseian languages into Siberia less than 3000 years BP [61] (pp. 70–72). Relevant examples are illustrated in Figure 3. Late Holocene cultural exchange over vast distances between west-central Siberia and western Alaska is a possibility that can no longer be discounted.



**Figure 3.** Illustration of Athabaskan and Siberian forged metal daggers: (a) Seven-inch Tahltan (or Gwich'in) forged steel dagger with leather-wrapped grip; 1850 or earlier. Anonymous private collection, on loan to the "Discovering American Indian Art Exhibit", McClung Museum of Natural History and Culture, University of Tennessee, Knoxville, TN, USA, Exhibited 29 August 2009 through 10 January 2010. Photograph by author. (b) Twelve-inch forged iron dagger, Tagar Culture, Southern Siberia, Krasnoyarsk Region (near Minusinsk), fifth century BCE. Inventory no, 1669-1. Courtesy of the State Hermitage Museum, St. Petersburg, Russia.

### 3.4. Ceramic Pottery

Notable P-A words for ceramics technology include \*ons'a', \*as'a', \*'usa:k' "clay pot" [26,34], and \*t's'a'k' "bowl, dish" [2]. Edward Sapir first noted the distribution of closely related Northern and Southern Athabaskan pottery words and further identified the likely Athabaskan vector for the transmission of a hair-tempered low-fire ceramic tradition from Alaska to Alberta [34]. This fact does not fit neatly into conventional models of Athabaskan ethnogenesis and dispersal, given the lack of ancient pottery industries in key intermediate areas. James Kari identified an archaic Dena'ina word derived from the same root, isuk' "clay pot", [26] (p. 566 n.3). He cited Frederica de Laguna's opinion that a Kachemak Bay archaeological ceramics tradition should be assigned to a Dena'ina rather than Eskimo provenance [60] (p. 245). De Laguna further noted 19th-century records of Eyak-made low-fired ceramic tobacco pipes, representing the southernmost example of indigenous Alaskan ceramics production. But the evidence for Athabaskan pottery traditions is generally circa 900 CE and later [24] (p. 123). Organic tempers yield ceramics more

prone to biodegradation, so it is possible that the scope and age of Athabaskan pottery craft are underestimated [62]. The relationship between P-A \*t<sup>s</sup>ʼaʼkʼ and P-Y \*siʔk “bowl, dish” is intriguing [2]. In personal communication with the author, Vajda has raised some subtle concerns with the phonetic relationships involved in the “dish” words, most significantly that he is unaware of other examples where N-D “onset \*ts corresponds to Yeniseian \*s before a high-back unrounded vowel.” Vajda did not see these objections as insurmountable and said, “this is the type of lexical item that might logically be expected to be cognate” [63].

#### 4. Discussion

Evidence of the late Holocene material culture of Western Alaska reflected in proto-Athabaskan lexical reconstructions has broader implications. A proposed southwestern Alaskan *Urheimat* fits well with the observed depth of Athabaskan language diversity in that region. There is a cluster of well-supported reconstructions of proto-Athabaskan terms for Siberian-derived technologies, including complex archery weapons (e.g., sinew-backed bows), ceramics, and copper blades, all of which are very late prehistoric introductions to inland Alaska and Yukon Territory. In some cases, associated cognate terms in Siberia suggest the possibility of Asiatic connections to the proto-Athabaskan population persisting until considerably later than is generally supposed. Migration with technological retention (rather than merely diffusion between populations) is suggested by archaeological, ethnographic and linguistic data in concert. One scholar to recognize the present problem is Jack Ives, who writes of the paucity of these key technologies in the Athabaskan interior, including the region corresponding to the alleged *Urheimat*:

Surprisingly, [adoption of the bow and arrow] did not occur until very late in time (ca. 1150 BP). Yet ... a cognate bow terminology exists throughout Athabaskan, whose speech communities must have been diverging long before the adoption of bows and arrows. ... The situation for ceramics provides a strong parallel. ... None of [the] 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 across 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 ... Once again it would appear that Athapaskan ancestors were aware of the technology but they did not adopt it for their own use [64] (pp. 328–329).

But Athabaskan genealogical *ancestors* were not necessarily Athabaskan *speakers*. Horizontal language replacement is a common pattern in world history [65]. DNA evidence suggests the recently admixed Asian component of Athabaskan-speaking populations is substantially less than one-fifth of their total genetic diversity [21] (p. 2). But proto-Athabaskan technology terms are reconstructed based on coherent technological patterns uniting various branches of the family in late prehistory, suggesting language and material culture are linked more closely than language and DNA. Derived pottery words are found among pottery users on the fringe of the expansion zone and are entirely absent in the non-ceramic heartland of the language family. The same can be said for sinew-backed bows. Where no complex bows were manufactured (e.g., in the alleged *Urheimat* of the Alaska-Yukon border region), there are no proto-Athabaskan-derived words for complex bows. How could a technology lexicon survive several millennia in a technological vacuum? In more recent work, Vajda has acknowledged that the D-Y “arrow” words in Asia and North America are, in fact, cognates, but he rejects the suggestion that the proto-word originally meant “arrow” in the proper sense, and his opinion here is informed directly by this material cultural vacuum in the Athabaskan heartlands.

These words for “arrow” may have originally denoted projectile points or sharp edges, and not necessarily arrows used with bows, since there is no firm evi-

dence of bow-and-arrow technology in interior Alaska or among Dene-speaking groups elsewhere until after 1300 CE [21] (p. 314).

The incorrect date (1300 CE) must be a typographical error, as subsequently, in the same book [21] (p. 464), Vajda correctly cites the work of Gregory Hare and colleagues stating the introduction of archery to the Athabaskan heartlands was 1300 years Before Present [66]. There is a problem with this interpretation, however. It is not only the “arrow” cognate that presents us with this conundrum. The ceramic and metal words do as well, for largely the same reason. Asiatic archery, Siberian-style hot-forge copper work and organic-tempered ceramics leapfrog from Siberia to the American interior at roughly the same time in the mid-Common Era. All three technological regimes proliferated in the Western Subarctic only very late, and yet the P-A linguistic evidence is abundantly clear that P-A speakers were intimately familiar with all three of these technological paradigms. All lexical data used to reconstruct the P-A proto forms is found among people who were early adopters of these technologies during the last 1000 years when these tools became diagnostic features of the Athabaskan expansion [27]. Indeed, the date of 1300 CE is highly relevant in this regard, as it is when the likely progenitors of the Southern Athabaskans first left material traces in caves in the Great Basin and Southwest, notably including archaeological evidence of sinew-backed bows which were reinforced with concentric rings of animal tissues, characteristic of Athabaskan bowyers [67] (p. 313), [68] (p. 181–182).

Flegontov et al. suggests the possibility that paleo-Eskimos (identified with the Arctic Small Tool tradition; ‘ASTt’) were close biological relatives of both Ket and Athabaskans, i.e., biological kin to extant D-Y speakers residing in both America and in Asia [12]. Intriguingly, both the earliest evidence of complex bows in North America and the earliest evidence of ceramics in the American Arctic is found in ASTt archaeological contexts circa 4000 years ago [46,64]. If the ASTt peoples were indeed biological relatives of N-D language speakers, this would seem to explain the existence of P-A archery and ceramics words [69] (p. 9–10). But sinew-backed composite bows were introduced twice to North America, first by Saqqaq peoples (ASTt Paleo-Eskimos) in a maritime hunting context. The weapon was difficult to manufacture in the treeless north and impractical for dispatching sea mammals from small boats where one hand must always hold an oar. The earliest arctic experiment with the bow and arrow failed, and the technology rapidly went extinct long before the Common Era [35]. The technology was reintroduced much later, during the late first millennium of the Common Era, in warfare contexts and for the hunting of terrestrial fauna. After the early introduction and subsequent extinction of sinew-backed-bow-making in America, even much simpler self-bows and arrows are entirely undetected in Arctic pre-history for approximately 2000 years, spanning the entirety of the Dorset (post-Saqqaq) cultural phase. Indeed, the rapid conquest of the Dorset by the Thule (Inuit) from the west and simultaneously by the Greenlandic Norse from the east was directly facilitated by this severe military disadvantage [70,71]. This gaping historical discontinuity disconfirms putative connections between Athabaskan archery tools and ASTt antecedents, whether or not ASTt peoples were distant cousins to N-D peoples. More recent DNA work suggests the N-D ancestors indeed were admixed between arctic Asian and earlier Native American peoples, but that the Saqqaq (ASTt) peoples, in particular, are not a good proxy for this trace of admixture [72]. Vajda’s assessment of the material cultural support corroborates this finding, noting:

The lack of archaeological evidence for the spread of ASTt or related coastal groups into Interior Alaska therefore argues against identifying the mid-Holocene ancestors of the Na-Dene as a direct offshoot of the pre-Inuit cultures of the North American Arctic. The stark contrast in material culture between Arctic coastal groups, on the one hand, and inland Na-Dene speakers, on the other, suggests that the Asian newcomers who contributed to the founding Na-Dene population must have been a separate group from those that founded ASTt in North America [21] (pp. 464–465).

The sudden reappearance of complex bows after approximately the late eighth century CE corresponds to the introduction of a suite of associated technologies known as the Asian War Complex [36]. This aligns precisely with the earliest definitively Athabaskan cultural strata, which are discernable via the direct historical method [27] (pp. 47–56). Likewise, ethnographic Athabaskan ceramics are not directly linked to earlier ASTt ceramics either but have much closer antecedents in the Lena Basin during the Siberian Bronze Age. Alaskan Athabaskan pottery and Northern Plains Athabaskan potteries both use hair temper and a low-temperature firing process, resulting in extremely lightweight, portable ceramics well adapted to mobile subarctic foragers [73]. These very unusual grey wares were not invented in North America but in the terminal Neolithic of central Siberia, appearing in northeast Asia in the Late Bronze Age and in central Alaska only after 900 CE [24,74]. They are not a degenerate form of ancient ASTt pottery cultures but an expedient and portable late Siberian innovation that spread to the New World during the concurrent Neo-Eskimo and Athabaskan expansions because it was ideally suited to the rapid mass migrations of the Middle Common Era.

The enduring tradition of processualism in American archaeology is associated with a natural science paradigm in the study of prehistory, presuming simple cladistic branching models for cultural evolution as a process governed by lawlike scientific principles [75]. The present work suggests an alternative historicist approach might be necessary to adequately grapple with the complex historical ramifications of D-Y culture history, given the evidence for a long period of sustained crisscrossing by relatives between intervening regions. Such a situation is arguably better accommodated by the flexibility of a world history paradigm that is accustomed to the more idiosyncratic effects of tumultuous historical circumstances. As Vine Deloria Jr. argued, the so-called New World was not really so far removed from the “turmoils and persecutions” of the Old World [76] (p. 597).

## 5. Conclusions

Krauss and Golla suggested that Proto-Athabaskan parted company with ancestral Eyak and then remained an undifferentiated unit during the interval of 1500 to 500 BCE or perhaps even later, residing somewhere in interior Alaska, Yukon Territory or Northern British Columbia [22]. They favored the eastern portion of this range as the homeland, despite the fact that the western margin of the spread zone is now the location of the greatest and oldest differentiation among Athabaskan languages. “An argument against a central or western Alaskan homeland is the lack of old or intense influence from Eskimo in the languages of that area” [22] (p. 68). Only the westernmost Alaskan Athabaskan languages show Yupik influence, suggesting that the proto-family could not have developed in long-term co-residence with ancestral Yupik speakers. Krauss and Golla’s remedy for this obstacle was to remove the proposed *Urheimat* eastward toward the Yukon borderlands, away from Eskimo influence but still tolerably close to the zone of high diversity. This has been the default assumption for decades. But is it really justified? As James Kari notes, “In over 40 years no specific ancillary support (linguistic or otherwise) has been offered for this proto-Na-Dene homeland area other than this area is (sort of) near the area of great divergence in the branches” [32] (p. 210) [77]. But what if the initial linguistic differentiation of Na-Dene branches were not entirely in situ? What if proto-Athabaskan and ancestral Eyak and/or Tlingit arrived separately, having their most recent common ancestor elsewhere entirely [78] (p. 270)? What if prehistoric western Alaska did not include a significant contingent of Yupik ancestors prior to the Athabaskan expansion? (Yupik demographic history is murky.) Alternatively, what if the duration of proto-Athabaskan residence in the *Urheimat* was relatively brief and the exodus sufficiently rapid to prevent any local extrafamilial influences from uniformly affecting the itinerant daughter dialects? A rolling stone gathers no moss. The extreme mobility characterizing ethnographic Dene groups is also strongly indicated in our best reconstructions of proto-Athabaskan cultural patterns [78]. One or more of these factors could easily account for the lack of surviving evidence of Eskimo influence on the southeastwardly thrusting arc of languages descended

from proto-Athabaskan. Whether or not one concedes a later date for the differentiation of Athabaskan languages is possible, one might also contemplate the possibility that ancestral N-D speakers then-residing in Northeast Asia colonized North America in two or three successive waves after their internal differentiation had commenced elsewhere. Sicoli and Holton suggested that Athabaskan is closer to Yeniseian than either D-Y branch is to Tlingit [6]. This is conventionally viewed as evidence in support of a back-migration of Proto-Yeniseian from Beringia, but it might alternatively reflect later Asian-American cultural ties and a more complex North Pacific Rim regional demographic history. If P-A daughter speech communities maintained mutual intelligibility later than is commonly assumed, or if Tlingit and/or Eyak lost contact with Yeniseian collateral relatives substantially before ancestral Athabaskan did, then back-migration from Beringia to Central Asia is not supported [79]. Given the proximity of non-Athabaskan N-D coastal peoples to the high-traffic North Pacific fur trade routes, we cannot make any inferences about which of the two continents was the cradle of N-D culture in general [80] (p. 492).

Recent work shows that Yeniseian speakers were likely among the elite members of the multiethnic Xiongnu (Hun) confederation, and thus Yeniseian-speaking peoples must have played a more prominent (than heretofore recognized) role in the history of Eurasia during the first millennium of the Common Era [81,82]. We should not dismiss a possible Xiongnu vector for Yeniseian cultural and linguistic influence in the North Pacific Rim just prior to the arrival of the Asian War Complex in Alaska. The possible existence of now-extinct D-Y dialects on the Asian side of Bering Strait during this period is conceivable. For a period of time around the beginning of the Common Era, the Xiongnu empire encompassed much of Southern Siberia from Manchuria to the Yenisei River. The Xiongnu-Yeniseian language (\*Kjet) is attested only in a small fragment of Chinese text showing affinities with other extinct Southern Yeniseian languages. These languages are so poorly attested that it is difficult to define their precise genetic relationship with Ket and other surviving D-Y languages [83]. But their mere existence is enough to force us to recognize that the ~3000-mile territorial gap between the present-day Ket and the Dena'ina (the westernmost Athabaskans) is made much less daunting when we acknowledge the likelihood that North China (the historical center of the Xiongnu state) had a significant Yeniseian population during recorded history.

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## Appendix A. Proto-Athabaskan Technology Reconstructions with Selected Attestations

The following list of key reconstructions with relevant citations and exemplary attestations in braces {}.

(1) arrow \*-q'a? [2], \*q<sup>2</sup>ã? [21], {Koyukon q'o?, Chipewyan k'a, Hupa -q'a?, Mattole k'a?, Navajo k'ā? [2]}.

(2) bowl, dish, plate \*t<sup>s</sup>'a k' [31] {Ahtna t<sup>s</sup>'ak Dena'ina t<sup>s</sup>'uk', Beaver t<sup>s</sup>'a? [2]}.

- (3) canoe \*č<sup>w</sup>i·x [30] (p. 128), \*č<sup>r</sup>i·x [21] (p. 360) {Upper Tanana ts'əy [84] (p. 239), Lower Tanana tr'i·y [84] (p. 79) Dogrib ts'i,<sup>1</sup> Chipewyan ts'i [85] (p. 45)}.
  - (4) clay pot \*ons'a', \*as'a' [34], \*'usa:k' [26] {Dena'ina isak [26], Tsuut'ina as'a, Deg Hit'an e'čo, ečo'xū, e'çok, Carrier onsa, Tse'khene onsha, Navajo ă'sā [34]}.
  - (5) hook (n.) \*šw əχ-t [31] {Chipewyan sá-t [86] (p. 45)}.
  - (6) metal knife \*weš<sup>w</sup>, \*wəš<sup>w</sup>, \*meš<sup>w</sup> [28] {Navajo/Apachean beeš ~ bééš, Tsuut'ina mas, Dogrib me, Chipewyan bis [87] (p. 100), Deg Hit'an vaxa [38], Tanana basr [28]}.
  - (7) quiver \*q'ā'-zə's [31] (p. 118) {Chipewyan k'á-kāθ [31] (p. 118)}<sup>2</sup>
  - (8) shoot (arrow) (v.) \*t'əq' [5] {Lower Tanana dek [88] (p. 67), c.f. Tlingit t'ù:g ~ t'úg [89] (p. 256), c.f. Eyak t'ik' [31] (p. 330)}.
  - (9) sinew-backed bow \*ts'ə-t-təŋ? [27] (p.156), {Deg Hit'an gi-t-təŋ? [38],<sup>3</sup> Dena'ina cí t-den [39], Hupa ts'it-tiŋ? [37]}.
  - (10) sled runner \*ka'n [20] {Deg Hit'an chin [38] (p.88) Dena'ina -ken [90] (p. 47) Holikachuk kin [91] (p. 50), Lower Tanana chenh [88] (p. 139), Upper Tanana čənə [84] (p. 79)}.
- Note 1: June Helm's Dogrib collaborators recognized this word as a Chipewyan loanword introduced during the fur-trade era.
- Note 2: The observed nasalization at the junction of the lexemes for “arrow” and “skin” in the Chipewyan form of this P-A compound is irregular and unexpected. Vajda suggests that Yeniseian comparanda can account for this situation because the corresponding P-Y cognate for arrow, \*qajm, renders this nasalization transparent [NEW 21] (pp. 313–314).
- Note 3: The initial -g- in Deg Hit'an is irregular, suggesting a Gwich'in loanword.

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