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Author(s): Michael E. Krauss

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PROTO-ATHAPASKAN-EYAK AND THE PROBLEM OF NA-DENE: THE PHONOLOGY

MICHAEL E. KRAUSS

UNIVERSITY OF ALASKA

0. Introduction
1. A new Proto-Athapaskan-Eyak consonant series
 - 1.1.1. Reconstruction of *k^w-series
 - 1.1.2. Post-PAE development of consonant series and classification of PAE languages
 - 1.1.3. Distributional patterning of series
- 1.2. PAE vowels
- 1.3. PAE suprasegmentals
- 1.3. Summary of PA stem-phonology
- 1.3. Examples for 1-4
2. Early study of Na-Dene
3. Phonological structure

0. The present paper was originally intended to follow a monograph on problems of Proto-Athapaskan, dealing especially with the stem-phonology. This monograph is being prepared for publication, but meanwhile a rapid resumé of some of the major points therein will be indispensable as background for the discussion on Na-Dene.*

Gratifying progress in the reconstruction of Proto-Athapaskan has been made on the sure ground of rigorous comparative method and adequate documentation. In sharp contrast to this, the discussion of Na-Dene is, of necessity, groping and highly speculative in many respects. Here not only the documentation but also simple comparative method still fail us. Indeed, the structure of Na-Dene is apparently so much more complex than the conventional models we use in comparative work that our understanding of Na-Dene relationships has progressed

* Where no reference is given, the source of data is my own field notes. I am also indebted for Eyak field notes (in manuscript) to Robert Austerlitz and Fang-Kuei Li.

discouragingly little except as a controversy in the past hundred years, in spite of a century's major advances in linguistic method, in documentation, and in the reconstruction of Proto-Athapaskan. The present paper begins with the intermediate step of the link between Athapaskan and Eyak (1), then proceeds to Na-Dene as a whole (2-3).

1. Representing Sapir's single Proto-Athapaskan *tš-series I found two phonemically opposed full consonant series¹ in a number of Alaskan Athapaskan dialects, notably Central Tanana (Minto-Nenana), Yukon Ingalik (Anvik-Shageluk-Holy Cross), Kutchin, Han. In all these there is a full series with strong retroflexion or retroflex affrication, /dr tr tr' sr zr/, opposed to /dz ts ts' z/, all corresponding regularly to each other among the dialects. In looking further afield for an explanation, I was led to reject a 'split'-hypothesis and to consider these two series as reflexes of two phonemically opposed series in Proto-Athapaskan

¹ While it is true that shifts or mergers of individual Athapaskan phonemes often differ according to position (stem-initial, stem-final, other), the consonant series themselves develop as a unit the same way in all positions. Position determines changes in manner of articulation (changes within series), but mergers between series (as defined by position of articulation) are not thus determined. The consonant series can therefore be taken as a kind of super-unit for our present purposes. In all Athapaskan (except certain Pacific Coast languages) breakdowns of the unity of these series are practically negligible. Stem-initials are the easiest to deal with simply because there the greatest variety of individual phonemes occurs and because morphophonemic complications, at least in many of the modern languages, are not nearly so great or poorly understood as in stem-final position.

(PA), and indeed in Proto-Athapaskan-Eyak (PAE).² There is also minor evidence for this in certain phenomena on the Pacific Coast (e.g. the 'irregular' Mattole /ši/ 'I' and the presence of both /š/ and /x/ in Mattole stem-finals, labialization in Hupa, and, particularly in Tolowa, retroflexion, about which more needs to be known). But it is the extinct (?) Tsetsaut, preserved by Boas (1924), that provides the strongest Athapaskan supporting evidence outside of

² This was first announced in a paper given at the December 1961 meeting of the LSA in Chicago. The Alaskan research (the first phase of which is a survey of the dialect phonology of all of Athapaskan Alaska and of Eyak, now nearing completion) has been supported by the National Science Foundation. I am also very much indebted to Harry Hoijer and Fang-Kuei Li for the use of unpublished material and for helpful discussions. I hope it is evident that the section on Proto-Athapaskan owes much to Hoijer's 'The Athapaskan Languages' (1963).

After the original drafts of this article were completed (Spring 1963), I had the opportunity to do fieldwork on Eyak (Summer 1963) in Cordova and Yakutat. There are still three fairly good speakers left. Partly with the aid of the more complete Athapaskan stem-lists now available, I made special effort to elicit as many different stems as possible, and succeeded, I feel, in collecting material which can yield a list of Eyak morphemes (especially stems) approaching completeness.

However, I have not used this material in the present article, except to correct or confirm the phonemic transcriptions of the Eyak examples cited. It can already be said with confidence, though, that the new Eyak data in general further substantiate the conclusions reached here, rather than call for significant revisions thereof.

At present (Winter 1963-1964) I am analyzing this Eyak material in preparation for further fieldwork on Eyak in the summer of 1964, in hopes that by then I will be in a position to collect the remaining information needed for a reasonably satisfying documentation and description of Eyak. It will then be time to proceed with a reasonably rigorous comparison of PA and Eyak. (In a preliminary check I found Athapaskan cognates for at least 180 out of about 800 etymologically distinct Eyak stems. This indicates that Eyak is probably not so divergent from Athapaskan as might have been supposed.)

Alaska. A Tsetsaut pf-series corresponds regularly² to the Alaskan tr-series, whereas corresponding regularly³ to the Alaskan ts-series there is the Tsetsaut ts-series. Then the Eyak k-series was found to correspond to the Alaskan tr- and Tsetsaut pf-series (as well as to the PA *k-series), whereas corresponding to the Alaskan and Tsetsaut ts-series is the Eyak tš-series. These correspondences are documented in over 60 forms (stem-initially) in the monograph, a few of which are cited here in the examples (1.5).

1.1.1. The nature of the reconstructed new series was examined from two angles, the phonetic and the structural. Both approaches lead clearly to the same conclusion. The most plausible phonetic prototype for the various modern reflexes of the newly established series (Alaskan tr, Tsetsaut pf, Eyak k, which has everywhere else merged with *tš) would be a labialized front velar, which I symbolize as *kʷ. The structural argument discloses a place in the pattern for just such a series of phonemes. A survey of Athapaskan shows that all three possible mergers between any two of the three Sapir PA series *ts, *tš, and *k do occur, without involving the third series: that of *ts and *tš without involving *k occurs widely in the Northern and Pacific Coast groups; that of *tš and *k without involving *ts occurs (but restricted to a few languages of the Pacific Coast group); and that of *ts and *k without involving *tš also occurs, universal in, but restricted to the Apachean group. It is clear from this that these three series of Sapir's reconstruction cannot be regarded as belonging in a linear arrangement, for no matter how arranged along one line, the impossible merger of two series without involving a series intermediate to them in the linear arrangement would be implied. We are therefore forced to rearrange these series in a two-dimensional

³ Of a total of 37 different identifiable forms for these series in the Tsetsaut corpus, at least 36 are regular.

pattern of series. Linguistically, now, instead of geometrically, this means that we must recognize another distinctive feature. In view of the already established PA opposition $*k : *k^w$, and the reconstruction of the newly established series as phonetic $*k^w$, the obvious answer to the question of the nature of this distinctive feature is labialization. The six PAE series mentioned here thus fall into a two-dimensional

pattern:

$*ts$	$*k$	$*k$
$*tš$	$*k^w$	$*k^w$

or, more

structurally than phonetically,

$*c$	$*k$	$*k$
$*c^w$	$*k^w$	$*k^w$

The symbols $*ts$ and

$*c$, on the one hand, and $*tš$ and $*c^w$ on the other, will be used synonymously.

1.1.2. The various developments in Athapaskan and Eyak can be neatly described by this model, especially in terms of the four series to the right, for it is these that show the greatest variety of development. The pattern of the above-mentioned Alaskan dialects can be described as

$tθ$	$tš$
ts	tr

, that of Tsetsaut (the in-

formant Levi) as

ts	$tš$
	pf

, that of the informant Timothy's Tsetsaut, with another

merger, as

ts	
	pf

, that of Eyak as

ts	k
$tš$	

, that of Apachean only as

ts
$tš$

, that of many Northern and

Pacific Coast dialects as

(with various reflexes), and with another merger,

also in many Northern and Pacific Coast languages, including Kwalhioqua-Tlatskanai

and probably Nicola, as

(with

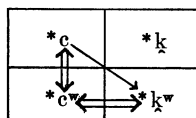
various reflexes), or, less often

(with various reflexes, restricted to the Pacific Coast). Probably the best proof of the validity of this interpretation is that no documented Athapaskan language or Eyak shows a merger between two indirectly opposed series in this pattern ($*c^w$ with $*k$ or $*c$ with $*k^w$) without involving one of the other series in the pattern.

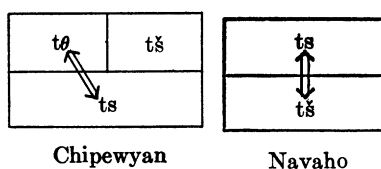
This model with its transformations according to the various mergers that can take place within it was found very useful for classifying the Athapaskan languages (and Eyak). Even a family-tree model can be constructed from it according to the attested mergers and resulting patterns, as certain attested patterns could not be developments of certain other patterns (e.g. the Tsetsaut patterns could not be derived from any other attested pattern than that attested by the Alaskan dialects mentioned above, likewise that of the Eyak, etc.). But there are many other very important types of phonological differentiation in the modern languages, such as loss of stem-final consonants in a very large continuous sector of Northern Athapaskan, which impose deep cross-classifications, and this most promising phonological family-tree model soon loses much of its usefulness. Further progress in classification will require careful study of the chronology of phonological changes in the sorting of inherited and diffused phenomena, collated with morphological, lexical, and ethnographical data.

1.1.3. Athapaskan and Eyak show certain interesting mutual exclusivities in the distribution patterns of these four consonant series, the most important of which

I shall describe here. In stems of the form CVC in Central Tanana and Yukon Ingalik the ts- and tr-series (< *c^w and *k^w) and the tθ- and ts-series (< *c and *c^w) are mutually exclusive. The stem-initial tθ- also excludes stem-final tr-series. With the exclusion expressed as an arrow pointing from the initial to the final series, these distributional restrictions may be diagrammed thus, in terms of the PA series:



Analogues to this may be found not only in Navaho, but also in Chipewyan (languages for which we have extensive lists of stems to constitute samples large enough for the absence of certain forms to be statistically significant):



These patterns are the equivalent of what the Alaskan would be with the mergers attested in Chipewyan and Navaho. It is therefore certain that these distribution patterns go back to PA, and probably to PAE (at least in part), for in Eyak, though the documentation is still far from abundant, at least the ts- and tš-series (< *c and *c^w) appear to be mutually exclusive in stems of the form CVC. It is not yet understood exactly what these patterns imply for the earlier stages of the development of PA(E), but it is clear that further understanding of them will be a very important step in deeper comparative work. It may well be, of course, that they are the result of assimilations, or possibly of pre-PAE splits. We are as yet in no position to judge.

However, whatever the pre-PAE significance of these distribution patterns, it is striking how, in the development of the modern Athapaskan languages from PA,

the oppositions between the two pairs which show this mutual exclusivity (*c^w and *k^w; *c and *c^w) are precisely those which show the strongest tendency to break down. Mergers between these series (and between *k and *k^w, which probably are also mutually exclusive in CVC-stems) are by far the most widespread.

Finally, whereas the opposition between the *k- and *k^w-series is often preserved in the form of opposition between vowels, that between the others was preserved mainly in the consonants themselves (especially in some of the languages which show no merger in these four series, e.g. Minto). But certain apparently irregular vowel correspondences in contexts involving the *k^w-series and even the *c^w-series can be explained this way too, where labialization persists as a vocalic instead of consonantal feature. Note the correspondences attested in examples 8, 10, 11, 57, 59, 60, 63. A converse hypothesis, that the labialization was originally a vocalic instead of a consonantal feature, seems inadequate so far to account at once for all the different types of CVC sequences in PA(E) stems implied by the modern languages. This is the point at which reconstruction of PAE consonants rests at present.

1.2. The PA vowel system consisted of four full vowels, as shown in Table 1. However, under certain conditions (originally having to do probably with the filling of positions in the stem after the vowel) stem-vowels were reduced (shortened and centralized). If we are to trust a comparison of Minto and other Alaskan dialects, Chipewyan, Navaho, Sarcee, and Mattole, it is almost certain that by the PA period this reduction had become phonemic, and that certain mergers between reduced vowels had already taken place, most notably that of both reduced *e and *i with *ə, leaving a set of only three reduced vowels, as shown also in Table 1.

This phonemic gradation is reflected in the complex systems of ablauts of the modern languages, and in seemingly chaotic corre-

59, 60, 63). In contexts with the **k*-series **A* and **U* were often shifted to **ə* (exx. 24, 64). In many languages, including Chipewyan and Navaho, but not Minto, **ə* was shifted to **A* before **x*, **g* (exx. 1, 7, 9, 43, 44). **ə* was further shifted to *i* in Chipewyan under the influence of **x̣* (and sometimes **n*) in T. (The term "umlaut" has been used for these shifts and that of full **e* to *i* before *n*.) In Navaho **ə* has otherwise completely shifted to *i*. Modern Navaho short *e* is almost exclusively the secondarily shortened full **e*.

There are also signs of a pre-PA ablaut between full **e* and **a*, often involving a nasal suffix, and calling into question the status of full **e* itself for a still earlier period. This was pointed out already by Sapir in 1915, and mentioned again by Li (1930a).

The Eyak data so far available are not adequate for establishing extensive PAE vowel correspondences. It appears on the surface, at least, that at that period there was also a system of four full vowels, and possibly also phonemic gradation. The old **e* ~ **a* ablaut may also be reflected in the correspondences so far found between PA and Eyak for these vowels. Eyak *a* usually corresponds to PA **a*, but sometimes also to Pa **e* (exx. 29, 31–34, 45; 4, 24, 61).

1.3. Tone was probably not phonemic as such in PAE, or even in PA. It is absent in Eyak, where a system of vowel-modifiers is found instead, as shown in Table 1. The Navaho reflexes of full vowels consistently have high tone where Chipewyan has low, and low where Chipewyan has high. (Sarcee follows the Navaho in this.) Because of the phonetically opposite reflexes in Chipewyan and Navaho, it would seem unlikely that the prototype could have been pitch-level. Perhaps it was a two-level stress system, or perhaps it was phonetically conditioned at least in great part by the absence or presence of **ʔ* in T, with which it is certainly intimately connected. The Eyak evidence would of course point to the latter possibility.

Pacific Coast Athapaskan, which has kept much of the glottalization and shows some stress but not tone, and the many Alaskan dialects apparently lacking phonemic tone in stems, e.g. Ingalik (as noted already by Sapir), Koyukon, and Minto, and many of which have kept the glottalization too (e.g. Ahtena, Tanaina, Upper Kuskokwim), also point away from tone. In Alaska, tone is highly developed only in those languages (Kutchin and Han especially) at the western edge of the large Northern Athapaskan area in which most consonants of T are lost as such.

For the reflexes of reduced vowels, Navaho shows consistently low tone; Chipewyan shows consistently high with **ʔ* (now lost) present in T, and apparently mostly low otherwise. High-toned short stem-vowels occur in Navaho almost exclusively as the secondarily shortened reflexes of PA full vowels (i.e. before zero or in stems in composition or with a suffix, e.g., the relativizer).

1.4. The modern evidence, not all of which has been touched upon in the foregoing discussion, permits the following summary of PA stem-phonology: stems consist of three primary segments, CVT, all of which must be represented, in the order indicated, and as specified by the following statements: C is any one of the consonants (as shown on Table 1); V is any one of the vowels (as shown on Table 1); T, for the present purpose,⁴ consists of perhaps seven positions (at least some of which are affixal), only the last of which must be filled. The subclasses of phonemes which may fill the positions of T, and their order, might be

⁴ In many modern languages, e.g. Navaho, the whole CVT sequence is normally reduced to a single monosyllable, regarded as the stem, not conveniently segmented or regarded as consisting of more than one morpheme by most Athapaskanists. Yet perhaps in most modern Athapaskan languages, at least many stems might as easily be regarded as containing obvious suffixes. We admittedly are far from having achieved a rigorous formal definition of the Athapaskan stem.

covered by a formula something like $n \text{ } ^? C' \left\{ \begin{matrix} t \\ x \\ d \end{matrix} \right\} \text{ } ^? \left\{ \begin{matrix} ? \\ h \end{matrix} \right\}$, where C is any one fricative, unmodified stop, or n, and where h = zero. (This formula appears to leave some problems unsolved, however, failing to account at once for all three widespread types of stem-final alternations: 'light' ~ 'heavy', glottalized ~ non-glottalized, stop ~ fricative. The correspondences seem so complex in this respect that there is reason to believe that they may reflect PA dialectal and/or morphological differences, and that they are therefore not reducible to a single PA formula of this sort. Eyak will undoubtedly provide crucial evidence for solving these problems as well as many others.)

Some further distributional restrictions are that certain pairs of consonant series are never represented in the same stems (i.e. are mutually exclusive as C and C'), namely the ts- and tš-, the tš- and kʷ-, and the k- and kʷ-series. Also, if the ts-series is represented in C, the kʷ-series may not be represented in C'.

w probably occurs only initially in stems, and is never followed by u or U.

The phonemes ɣ, ʃ, and dz occur with relatively low frequency as stem-initial C.

The structural relationship between h (= zero) and w (and between ? and labialized ?, which may also exist as a phoneme), between the t- and tl-series, and between the ts- and tš-series, probably is, in some respects, the same as that between the k- and kʷ-series and between the k- and kʷ-series. To carry the binaristic interpretation further (in articulatory terms), the t-series would be apical, the tl-labialized apical, the ts-palatalized apical, the tš-labialized-palatalized apical, the k-dorsal, the kʷ-labialized dorsal, the k-palatalized dorsal, the kʷ-series labialized-palatalized dorsal.

Unless in absolute initial position, all fricatives, except sometimes (facultatively?)

ɣ, immediately followed by a vowel or by ? are probably automatically voiced phonetically, otherwise unvoiced phonetically.

Morphophonemic alternations occur in V: sometimes i e a ~ U, in context with labialized consonants, especially labialized back velars; sometimes a u ~ ə, in context with the k-series, especially ɣ in T; sometimes i e ~ A before x g (probably post-PA, not universal); otherwise i ~ ə, e ~ ə, a ~ A, u ~ U.

Conceivably all phonemes in T are affixal. There is an alternation between the absence and presence certainly of ə, of at least many n l ɣ d ?, and of at least some C'.

1.5. It is hoped that the following examples, though few in number for lack of space, will suffice to illustrate most of the points made above. The first 16 are chosen mainly to show the contrasting reflexes of the PAE tš- and kʷ-series. The Kutchin (K, general, except where MP specifies Fort MacPherson), Han (H, Eagle), and Tsetsaut (Ts, as recorded by Boas) forms are not completely phonemicized, and the tones, though phonemic at least in K and H, are not indicated; but a phonemic opposition between the reflexes of the two PAE series is certain. I is Yukon Ingalik (dialect of Anvik, Shageluk, Holy Cross). M is the Central Tanana dialect of Minto and Nenana. Correspondences for the other consonant series are already well enough established not to need illustration here by examples specifically chosen for that purpose. The succeeding examples are chosen mainly for vowel and tone correspondences, 17-34 for full vowels, 35-58 for reduced vowels, 59-65 for a very few ablauts. For the sake of brevity, here only M, Ch (Chipewyan, from Li 1933b), N (Navaho, from Haile 1950-1951), and sometimes Mat (Mattole, from Li 1930b) and S (Sarcee, from Li 1930a) forms are given. The regular reflexes of PA i e a u in Minto ([i ə ɔ u]) are transcribed i a o u, in Ingalik ([e a o e]) are transcribed i a o i, and that of ə in both Ingalik and Minto is transcribed e. Absolute

final *y* in both languages is voiceless. The use of *o* for transcribing the regular reflex of PA *u* in N and Mat is adhered to, but the transcriptions of the consonants are sometimes altered to be more in line with those for other phonetically similar units in the languages. Where one form for a verb-stem is given, unless otherwise specified it is either the imperfective or the stem is invariable; where two are given, connected by the symbol N the first is the imperfective, the second the perfective. PA forms are tentatively reconstructed. Because of our imperfect understanding of the structure of T, the reconstructions ventured here are left incomplete in that C' is shown arbitrarily as reflected by the Minto form and in that ? is always shown following C'. PA final *h* (= zero) is indicated by space.

Eyak cognates are given where so far available and plausible, but reconstruction of PAE forms is obviously still too formidable a task. The number of Eyak cognates, many of which were first identified by Li (1954), is deceptive: their availability strongly influenced the choice of examples.

1. -džəx-ə? *ear* > M -dzeɣa?, I -dzeɣe, K -dzeɣ?, H -dzay?, Ts -dze?, Ch -dzàɣá, N -džàà?; Eyak -dže^hx, and (sometimes in composition) džaɣa-.
2. džex? *spruce gum* > M dzax, I dzax, K dzii, H dzee, Ts tse? (/dz-/), Ch dzé, N džèèh, Mat džeh.
3. -g^wa-(də?) *leg* > M -dro-(da?), I -dro-, K -dreed, H -drææ, Ts -bva, Ch -dzàré, N -džáád, Mat -džaade?.
4. g^we-n *day* > M dran, I dran, K drin, H drin, Ch dzì, N džì, Mat džìŋ; Eyak ga^h, and ge-l-a-ʔa-k *noon*.
5. tša? *beaver* > M tso?, I tso, K tsee, H tse, Ts tsa, Ch tsá, N tsàà?
6. -tšu(-) *grandmother* > M -tsu, I -tsi-, K -tsũũ, H -tso, Ts -tso, Ch -tsũ *mother-in-law*, N -tšó, Mat -tšoo; Eyak -tšũ-. (The nasalization in some Athapaskan may be from a vocative suffix.)
7. -k^wəx *weep* > M -trex, I -trex, K -tree, H -trə, Ts -pfe, Ch -tsàɣ, N -tšà, Mat -tšeh; Eyak -kĩ x.
8. k^wəg^w *dry wood* > M tredr, I tredr, K(MP) trow, H trod, Ts pf^wo, Ch tsèz (secondarily lengthened ə > ε?), N tšìž, Mat tšìš; Eyak kux-l. Labialization of vowel in some Athapaskan and Eyak due to consonant context.)
9. -tš'əx (reduced from -tš'ex, also attested) *open mouth, yawn* > M -ts'ex, I -ts'ex, K -ts'ee, H -ts'ə, Ts -ts'e, Ch -ts'àɣ, N -tš'əh; Eyak -tš'e^hx.
10. -tš'əš? (= -c^wəš^w?) *elbow* M -ts'es, I -ts'edz, K(MP) -ts'ow?, H -ts'a, Ts -tse? (/ts'-/), Ch -ts'úz (secondarily lengthened vowel), N -tš'òðž (cf. Ch.), Mat (Goddard, Bear River, UCFAAE 24:5, 1929) -te'ac; Eyak -tš'its'. (Labialization of vowel in some Athapaskan due to consonant context.)
11. -k^wəx *wind (blows)* > M -tr'ey, I -tr'ey, K -tr'ey, H -tr'əy, Ts -pf'e, Ch -ts'ì, N -tš'ì, Mat (Goddard) -te'i; Eyak k'uy.
12. -k^wəd? *scratch (vb.)* > M -tr'ed, I -tr'ed, K -tr'əd, H -tr'əd, Ch -ts'ór, N -tš'id; Eyak -k'it'.
13. ši *I, me* > M si, I si, K(MP) s'ii, H šan, Ts s'əna', Ch sì, N ší, Mat ši. (Mattole form is regular. Some Athapaskan has reduced vowel and -nə suffix.)
14. še-n(-ə) *summer* > M san, I san, M(MP) s'in, H šin, Ts tza'ne (Timothy, who often has a where Levi has ε; /sæn-/), Ch sìnè, N šì.
15. x^wa *sun* > M sro, K sree, H srææ, Ts -f^wá, Ch sà, N šá, M xaa.
16. -x^wén *black* > M -zren, I zren, K -zrāy, H -zrēy (Alaskan forms regular), Ts (ada)-foa ([f^wa]) *pupil (of eye)* (cf. N -nážlìn), Ch -zèn, N -žìn. Mat -xin.
17. -ni ~ -ni? *say* > M -ni?, Ch -nì ~ -ní, N -ní ~ -nild (-d analogical), S -ní ~ -nì?, Mat -nii ~ --; Eyak -le^h ~ -li-l.
18. -tsi? *head* > M -tθi?, Ch -tθí, N -tsìl?, S -tsì?, Mat -tsi?; Eyak -tsi? -(la^h) *pillow, comb*.

19. *tu water* > M *tu*, Ch *tù*, N *tó*, S *tú*.
20. *-x^wu[?] tooth* > M *-γu[?]*, Ch *-γú*, N *-γòò[?]*, Mat *-γo[?]*; Eyak *-xu[?]-l*.
21. *-kud grab* > M *-tšud*, Ch *-tšùd*, N *-tsóód*, S *-tšú[?]* (d-), Mat *-tçoh* (-tçod) Hupa-kid; Eyak *-ku[?]t*.
22. *-duns creep* > M *-duθ*, Ch *-dùθ*, N *-dóós approach woman stealthily at night*, S *-dús*, Mat *-doos*.
23. *-x^wun good, pretty* > M *-zrun*, Ch *-zũ*, N *-zô* Mat *-xoon*.
24. *tse stone* > M *tθa-*, Ch *tθè*, N *tsé*, S *tsá*, Mat *tsee*; Eyak *tsa[?]*.
25. *-de[?] horn* > M *-da[?]*, Ch *-dé*, N *-dèè[?]*, S *-dà[?]*, Mat *-de[?]*.
26. *-ke[?] foot* > M *-ka[?]*, Ch *-ké*, N *-kèè[?]*, S *-kà[?]*, Mat *-ke[?]*; Eyak *-qi-* (in prefixes).
27. *-xe(n)x^w-(ə[?]) egg* > M *-γazra[?]*, Ch *-γézé*, N *-γèèžíí*, S *-γàs*, Mat *-γeexe[?]*.
28. *t'ex^w charcoal* > M *t'asr*, Ch *t'és*, N *t'èèš*, S *t'às*, Mat *t'eex*; Eyak *t'u[?]tš'k* (cognate?).
29. *ya sky* > M *yo*, Ch *yà*, N *yá*, Mat *yaa cloud*; Eyak *ya-q[?]-t*.
30. *ya[?] louse* > M *yo[?]*, Ch *yá*, N *yàà[?]*, S *yà[?]*, Mat *ya[?]-*.
31. *-ta[?] father* > M *-to[?]*, Ch *-tá*, N *-tää[?]*, S *-tà[?]*, Mat *-ta[?]*; Eyak *-ta[?]*.
32. *-t'a-n[?] leaf* > M *-t'on[?]*, Ch *-t'á*, N *-t'áá[?]*, Mat *-t'an[?]*; Eyak *-t'a[?]-l*.
33. *ts'ag[?] plate* > M *tθ'og*, Ch *tθ'ái*, N *ts'ää[?]*, M *ts'a[?]*; Eyak *ts'a[?]-k-l dipper*.
34. *-sad[?] mouth* > M *-ðod*, Ch *-ðá*, N *-zà*, Mat *-sa-*; Eyak *-sa[?]-(t)*.
35. *ðed smoke* > M *ðed*, Ch *ðèr*, N *ðid*, Mat *li[?]*; Eyak *lã[?]t*.
36. *-səd[?] liver* > M *-ðed*, Ch *-ðér*, N *-zid*, Mat *tsi[?]l*; Eyak *-sa[?]h^t*.
37. *-wəd[?] belly* > M *-bed*, Ch *-bór*, N *-bid*, S *-mi[?]*, Mat *-bi[?]l*; Eyak *wut[?]*, *wat[?] vomit*, ГОТТЪ *Bauch* (Radloff 1857 < Rezanov 1805 ms.)
38. *-tsən[?] flesh* > M *-tθenz*, Ch *-tθón*, N *-tsi[?]*; Eyak *-tse[?]*.
39. *-ts'en bone* > M *-tθ'en*, Ch *-tθ'èn*, N *-tsin*; Eyak *-ts'al*.
40. *-ts'ənə[?] bone (possessed)* > M *-tθ'ena[?]*, Ch *-tθ'èné*, N *-ts'ìn*. (Secondary lengthening in Ch and N, cf. exx. 1, 8, 10, 44, 48, 66, 68.)
41. *-kən sticks* > M *-tšen*, Ch *-tšín*, N *-tsin*, Mat *-tçin*; Eyak *-kĩ^h*. (n-umlaut in some Athapaskan, especially after *k*.)
42. *-x^wəx^w sip* > M *-zresr*, Ch *-zèz*, N *-žiz*, Mat *-xix*.
43. *(-)x^wəx-l hook* > M *srex*, Ch *sàl*, N *-šàh* (vb.), Koyukon *sextl*, Mat *-xał* (vb.).
44. *-tš'əx(-ə[?]) hat* > M *-ts'e[?]ya[?]*, Ch *-ts'áá*, N *-tš'áh*, Mat *-tš'ah* (Ch, N *ə* > A, cf. exx. 1, 7, 9, 43; N and Mat without suffix); Eyak *tš'iya[?]h^t* (cognate?).
45. *-tAdl[?] heel* (-ke-tAdl[?], reduced from *-tadl[?] move foot* ?) > M *-tUdl*, Ch *-tál*, N *-tál*; Eyak *(-qi)-tatl[?]* (cf. *-ta[?]tl[?] move foot*).
46. *k'A[?]x[?] willow* > M *k'Uy*, Ch *k'ái*, N *k'ái*, Mat *gai-*.
47. *-gAn dry* > M *-gUn*, Ch *-gàn*, N *-gàn*.
48. *-gAnə[?] claw, nail* > M *-gUna[?]*, Ch *-gàné*, N *-gààn* (reduced form of *-ganə[?] arm* > M *-gona[?]*, Ch *-gàné*, N *-gààn*, with normal merger of A and a in Ch, secondary lengthening in N ?).
49. *gAx rabbit* > M *gUx*, Ch *gà*, N *gàh*; Eyak *Gax*.
50. *xAx winter* > M *xUy*, Ch *xáy-*, N *xáy-*, Mat *xai-*.
51. *-kAn[?] husband* > M *-kUn[?]*, N *-kà[?]*; Eyak *-qa[?]*.
52. *k^wUs cloud* > M *k'Uθ*, Ch *k'òθ*, N *k'òs*; Eyak *q'a[?]h^s*.
53. *x^wUx^w thorn* > M *xU^r*, Ch *xòs*, N *xòš*, Mat *-kox-*.
54. *x^wUx^w frost, dampness* > M *srUx*, Ch *sòγ*, N *sòh*.
55. *-gUd[?] knee* > M *-gUd*, Ch *-gór*, N *-gòd*, Mat *-go[?]l*; Eyak *-Gu[?]h^t*.
56. *k^wUn[?] fire* > M *kUn[?]*, Ch *kún*, N *kò[?]*, Mat *ko[?]q[?]*; Eyak *-qu[?]-* (in prefixes).
57. *sUn[?], tsUn[?] star* > M *sen[?]* (< *šenz* = *s^wən[?]* < *sUn[?]*). Shifts between vocalic and consonantal labialization may prove very important in further reconstruction of PAE.), Ch *tòèn* (labialization lost), N *sò[?]* (regular), Mat *tsin[?]* (labialization

- lost), Koyukon *tlUnʔ* (regular, < *tsUnʔ*).
58. *dUn* *housefly* > M *dUnʔ*, N *dð-*. (Exx. 57 and 58 indicate that U, though perhaps unstable elsewhere, was not found exclusively in contexts including labialized velars.)
59. -*gʷed*, -*gʷəd* > -*gʷUd* *poke* > M -*gUd*, Ch -*gər*, -*gòr*, N -*gééd*, -*gòd*.
60. *kʷəgʷʔ*, *kʷ'əgʷʔ* (> *kʷ'Ugʷʔ*) *abscess* > M *tr'edr* (< *kʷ'əgʷʔ*) Ch *ts'éɛ* (< *kʷ'əgʷʔ*), N *tš'əž* (< *kʷ'Ugʷʔ* < *kʷ'əgʷʔ*).
61. -*tes*, -*təs* *crossing over* M -*teθ*, Ch *tés*, N -*tis*, Mat -*tees*; Eyak -*ta's-*.
62. *kʷ'edʔ*, -*kʷ'ədʔ* *tight* > M -*tš'ed*, Ch -*tš'éd*, N -*ts'íd*, Mat -*ts'yeʔ*. In many of these exx., as in 8, the full (or secondarily lengthened ?) form appears especially in Ch, and it is difficult to distinguish between original full forms and secondary lengthening.
63. -*kaxʷʔ* ~ -*kAxʷ* > -*kUxʷ* *big* > M -*tšox* ~ -*tšUx*, Ch -*tsá*, -*tsòɣ*, N -*tsàà*, -*tsòh*, Mat -*tçah* (-*tçaay*), -*tçoh*.
64. -*kudz-əʔ* *feathers*, *kUdz* > *kədz* (*moulting*) *duck* > M -*tšudžaʔ*, *tšedθ*, Ch *tšəð*.
65. -*tsUxʷ* ~ -*tsuxʷʔ* *yellow* > M -*tθUx* ~ -*tθux*, Ch -*tθù* ~ -*tθú*, N -*tsò* ~ -*tsòð*, Mat -*tsow*.

The following examples indicate that there may have been other types of consonant clusters in T, which result sometimes in disyllabic stems in some modern languages. Some of these may be borrowings from the outside PAE, and often have to do with flora or fauna. Note that N does not show the shift *ə* > *A* before *x* in these cases.

66. *t'əxs* *cottonwood* > M *t'eyeθ*, N *t'is*; Eyak *t'aɣks* (perhaps a unique cluster in Eyak too).
67. *k'ə(x)ʷ* *alder* > M *k'esr*, N *k'is*, Mat *k'iyix*.
68. *tl'əxxʷ* *snake* M *tl'eyesr*, N *tl'is*, Mat *tl'iyis*.

69. *tsəlxʔ* *squirrel* M *tθeley*, Mat *tsalis* (< *kəls*, by metathesis); Eyak *tsalkʔ*.

2. Let us now extend our horizon to the hypothesis of a Na-Dene family, of which PAE would form a part. The question of Na-Dene relationships is no novelty, having come to the attention of Europeans already in the 18th century. Perhaps the earliest published record of a Na-Dene language is Edward Thompson's Chipewyan vocabulary collected in 1742 (Dobbs 1744). William Anderson in 1778 was evidently the first to record Alaskan Athapaskan. His Prince William Sound vocabulary (Cook 1784) is Chugach Eskimo, but the numerals are Tanaina. Perhaps the first Tlingit data were obtained by Lamanon in 1786 [Lapérouse 1797]. Unfortunately, only the numerals and five nouns were published and discussed, but "a more extensive vocabulary, comprising the languages of the different nations visited by our navigators, has been mentioned; it is the work of Monneron, Lesseps, Lavaux, Lamanon, Mongès, Receveur; but it never came to hand. (Editor's note)". Shorter Tlingit vocabularies were collected by Portlock and Dixon a year later. In 1791 Chanal and Roblet both collected Tlingit vocabularies, and Chanal also Haida numerals and six nouns. Chanal's, Roblet's, and Dixon's Tlingit numerals, Chanal's Haida numerals, and Anderson's Nootka numerals (from Cook 1784) are compared in Fleurieu [1798–1800], to show that Tlingit, Haida, and Nootka are all unrelated. Russian contributions of the first decade of the 19th century renewed speculation: e.g. both Davydov and Lisianski collected vocabularies of both Tlingit and Tanaina. More important, however, though unpublished, was the work of Rezanov, who by 1805 had collected extensive vocabularies of Tanaina, Tlingit, and for the first time, Eyak (which was to wait another 125 years for rediscovery by the Americans). Rezanov's manuscript, which I have not seen, is preserved in the Lenin

Library, Moscow. According to Adelung and Vater (1816), which includes a careful discussion of the problem, Rezanov evidently saw similarities between Eyak, Tlingit, and Tanaina, but concluded that the vocabulary resemblances were the result of borrowing. Adelung and Vater, however, do not feel ready to commit themselves on whether these similarities are evidence for borrowing or for genetic relationship. They do agree with Fleurieu, though, that Chana's 17 Haida words do not disclose any relationship between Haida and other languages of the area. The editors of Wrangell's materials (Wrangel' 1839) believe Tanaina, Ahtena, Ingalik and Kolchane [Transitional Upper Tanana] to be dialects of one language [Athapaskan], and that Eyak, Tlingit, and Athapaskan are widely divergent but genetically related, and are clearly distinct from Eskimo-Aleut, Nootka, Salish. By the 1850's Hale and Turner had fully established Athapaskan (all three geographical groups), and Buschmann and Radlov in Europe were at work on deeper relationships. Buschmann finds Eyak and Athapaskan related, but Tlingit separate. Radlov (1858) feels that Eyak might be genetically related to Athapaskan, but also that the considerable vocabulary Eyak shares with Tlingit probably indicates a genetic relationship between these two, as well as borrowing. Both Radloff and Buschmann feel that Haida may be related to Tlingit, but that this cannot be proven with the inadequate data currently available. Tikhmenev (1861-1863) gives an interesting account of what some Russians who followed such matters must have believed: "The Tlingit language can be divided into three dialects: Sitka, Yakutat, and Haida.... The dialects of the Eyak, Ahtena and interior Alaskan Athapaskans are different from the dialects of the Tlingit... but similarity of some words points out that they belong to the same common root [as the Tlingit dialects]". Around the turn of the century the question was ex-

amined under much more intense scientific light, especially by Swanton and Boas for Tlingit and Haida, but it remained for Sapir to formulate and work out the first detailed hypothesis in modern structural terms. Unfortunately, however, the Americans had meanwhile lost track of the earlier work, and therefore completely lost track of Eyak, although it had been well documented by the Russians (Radlov 1858 includes Rezanov's 1,132-item Eyak vocabulary, carefully edited). During this time American linguists, including Powell, misled by assumptions of Dall and Petroff, dismissed Eyak as Tlingitized Eskimo. It is doubtful that the Rezanov-Radlov work was ever consulted, or even that much thought was given to Radlov's findings as discussed in Krause (1885). Eyak was not rediscovered as such until 1930 by Frederica de Laguna, and further investigated by the Danish-American expedition in 1933, almost too late. American science, so impressed with its own progress that it often takes no interest in what very abruptly becomes the 'prescientific' era, has in this case at least lost considerable time thereby, and perhaps much useful information for progress in solving the problem of Na-Dene.

This discussion is an attempt neither to defend nor to reject the Na-Dene hypothesis, but is rather an examination of the question, which I now consider in some senses more open than ever. The use of the term Na-Dene here will be specially described. It is certain that it refers to a group of languages somehow related (Athapaskan, Eyak, Tlingit, Haida), but I do not mean to imply by the use of the term that I consider it certain that these languages are genetically related in the conventional sense. Nor do I propose to enter into the general controversy about the weight to be attributed to morphological similarities as evidence for genetic relationship. I intend rather to present what I can observe about Na-Dene.

3.1. The phonemic system of Tlingit has been well established by now, especially by Boas, confirmed by Velten for a more southerly dialect, and most recently for the Angoon dialect by Naish and Story of the Summer Institute of Linguistics, who have established another consonant phoneme, /h^w/. Dialectal variation is slight, nowhere sufficient to prevent mutual intelligibility.

For Haida we have Sapir's *The Phonetics of Haida* (1923), a very remarkable feat for its time, based on a few hours' work with a Haida informant in 1920 to supplement Swanton's analysis.

With these two structures may be compared the present reconstruction of the Proto-Athapaskan system and a Li-Austerlitz-Krauss analysis of Eyak. For the sake of uniformity of symbolization, the front and back velar series of Athapaskan, Tlingit, and Eyak (labialized and non-labialized) will all here be symbolized as *g k k' x, g^w* etc.; and *G q q' x, G^w* etc., respectively.

It will be immediately apparent that the present reconstruction of Proto-Athapaskan shows a much closer resemblance to Eyak, Tlingit, and Haida than did the Sapir reconstruction. Yet, although this has the appearance of being a significant breakthrough, it will be seen that it so far has, disappointingly enough, led no further towards the establishment of correspondences for identifying cognates.

It should also be stressed here, as should be clear from the first sections of this paper (0-15.), that the reconstruction of PA stands as such on entirely internal evidence, having been made quite independently of Na-Dene considerations. All the more striking is it then, with this borne in mind, how inevitably the reconstruction of PA brings it into close similarity with the rest of Na-Dene.

Practically the only difference now between the phonological structure of Proto-Athapaskan and Eyak-Tlingit-Haida would be the presence of complete voiced and voiceless rows of fricatives, but it is very

doubtful that a phonemic opposition between these complete rows existed as such in PA. Eyak differs from the others most importantly in that the labialized velars (both front and back) are lacking. (In this respect Eyak and some Alaskan Athapaskan resemble Eskimo.) I am not altogether certain, however, that this is entirely so, and do not discount the possibility that with further study of Eyak at least some phonemically labialized velars may be shown to have persisted. At any rate, vocalic evidence for the existence of at least labialized front velars at a certain stage of Eyak can be observed in examples 8 and 11. Tlingit differs from the others mainly in the presence of a full row of glottalized fricatives. The possible correspondence of these to Athapaskan glottalized stops and certain exceptional voiceless fricatives which sometimes fail to follow the mechanical rules for voicing should be investigated.

The vowel systems of PA, Eyak, and Tlingit all show four full vowels. PA and Tlingit both have a full or nearly full set of reduced vowels. PAE and Tlingit both show signs that **e* may have been secondary. Haida differs from these three in that it lacks, except in some dialects as a secondary development from a + *i*, the **e* of PAE-Tlingit. This may tie in closely with the special status of **e* in PAE-Tlingit. Haida has vowel length, which, according to Sapir, is probably wholly secondary. This length may correspond with PA-Tlingit gradation. Sapir's analysis is not complete for the Haida tone-stress system, but he makes it clear that some such system exists. It may correspond to the Tlingit (-PA?) tone-stress or Eyak (-PA?) vowel-modifiers.

Haida appears divergent from PAE-Tlingit in a number of other respects, involving the consonants. It has a relatively well-developed system of labials and, especially, of glottalized and non-glottalized sonorants (/m n ŋ w l y/), and has a *dž*-series and a *g*-series where the rest have *dz*- and *dž*-, respectively.

TABLE 2

TSIMSHIAN	(??)	b	d	dz	g	g	G		
		p	t	ts	k̥	k	q	kʷ	(and possibly a full set of
		p'	t'	ts'	k̥'	k'	q'		labialized front and back
	h	W	ɬ	s	x̥	x	x̥		velar series)
		w	l	z	y	(ɣ?)	(R?)		
		'w	'l		'y				
		m	n						
		'm	'n						

Further, there are certain resemblances in phonemic distribution which bring these languages even closer together than the table alone would indicate. Most importantly, there is the basic stem-structure /CV(C)/. Stem-initial consonant clusters are restricted to Haida, where they are of limited variety and probably secondary. Primary vowel clusters probably do not exist in any of these groups. Stem-final consonant clusters are apparently limited to two consonants (unless one counts /n/ and /ʔ/ in Athapaskan) in Athapaskan, Tlingit, and Haida. These are also of limited variety, especially in Athapaskan, where it is clear that they are almost always the result of suffixation. It is even conceivable that all stem-final consonants were originally the result of suffixation, as Sapir seems to suggest. This theory of course greatly relieves the difficulty of making plausible comparisons, but may be based more on the desire to do this than on reality. Eyak, where stem-final clusters of at least three consonants, and these of some variety, are frequently to be found, will constitute somewhat of a stumbling-block for this hypothesis until such a time as these Eyak clusters can be analyzed.

Another important type of distributional restriction common to Na-Dene is the lack of an opposition between the unmodified and aspirated stop rows in stem-final position.⁵

⁵ Here it might be added that the peculiar Athapaskan and Eyak restrictions in distribution (mutual exclusivity of certain stem-initial and stem-final series) discussed in 0.4. do not appear to be shared by Tlingit, which has forms like

The distributional characteristics here described clearly set Na-Dene apart from the other Pacific Northwest languages, especially the Salishan, which are well-known for their much freer consonant distribution.

In an evaluation of the resemblances in the structure of phonemic inventory among the Na-Dene languages for the establishment of a genetic relationship, these structures should be viewed in the context of what is found in the Pacific Northwest in general, known for its characteristically well-developed consonant systems, with glottalized rows and a relatively high number of vertical series (positions of articulation), including laterals and front and back labialized and non-labialized velars. The Na-Dene pattern is of course not so strikingly unique when seen in this context.

The Na-Dene consonant system is probably best characterized as a set of eight vertical series: simple apicals (which lack a fricative), laterals, two palatal affricates (labialized and nonlabialized?), two front velars and two back velars (labialized and nonlabialized), and a very restricted set of labials. There are three rows of stops (unmodified, aspirated, glottalized) and one or two rows of fricatives. There are perhaps four full vowels, each of which can be (phonemically?) reduced, but with very

s'atš 'fern', tšás 'pink salmon', dzixʷ 'small clams', s'aɣʷ 'hat', -tš'Äkʷ 'carve wood', -gʷAš 'hop', which, if translated into PA series corresponding to the Tlingit series in the table above, would show combinations of initial and final consonant series which are conspicuously unattested for PA.

strong indications that *e* is of secondary status; and a stress- or tone-system, or vowel modifiers.

For a clearer idea of what degree of uniformity and uniqueness ought to be attributed to Na-Dene thus described, a look at Hockett's *Manual of Phonology* can help. Many languages of the area share some of these traits, but none listed in Hockett seems to share the whole constellation. Many of them lack one consonant series to correspond with Na-Dene and have a full series of labials (Kalispel, Bella Coola, Kwakiutl). Nootka, Duwamish and Snoqualmie come closer in this respect, having all the Na-Dene series but including a full series of labials, and for the most part lacking a horizontal row (contrast between unmodified and aspirated stops). Tillamook lacks the labials, but also lacks the opposition between unmodified and aspirated stops, and in addition lacks the two labialized velar series. A close neighbor to Na-Dene, Tsimshian, has the three rows of stops, but lacks the lateral stops and perhaps the labialized front and back velars (for the most part), has a magnificent set of labials,⁶ and has a vowel

⁶ This is particularly striking in view of the fact that the Tsimshian used labrets as well as the Tlingit and Haida. It seriously weakens the argument for the correlation between the use of labrets and the lack of labials, in support of which Haida and especially Tlingit have often been mentioned as examples. Furthermore, though we have no evidence that the Athapaskans or the Eyak ever used labrets, Proto-Athapaskan and Eyak are at least as poor in labials as are Haida and Tlingit. The Na-Dene lack of labials, then, is far stronger evidence in favor of the unity of the

system varying dialectally, but with probably more primary vowels than four. The system of sonorants (glottalized and non-glottalized /*m n w l y*/) is strongly reminiscent of that of Haida, however. The following re-arrangement of the Tsimshian consonant pattern (from Boas 1911) is interesting to compare with the Haida on Table 1.

This pattern and that of the Haida are also reminiscent of Bella Coola and some other Salishan, especially because of the double system of sonorants.

To sum up an evaluation of the uniformity and uniqueness of the Na-Dene phonological structures within the context of other Pacific Coast types, it would seem that even if nothing else held them together, they would be classed typologically as a group apart from the rest on this phonological basis. Haida, however, stands somewhat apart from the Athapaskan-Eyak-Tlingit in certain respects, in which it resembles nearby Tsimshian from which it has also borrowed some vocabulary and certain Salishan languages, e.g. Bella Coola. In the other direction too, i.e. in Eyak and some Athapaskan (notably Tanaina, most Ahtena, most Koyukon, and, partially, Ingalik) which border on Eskimo, the velar series are in the main reduced to two, a simple front series, *k*-, and a simple back series, *q*-, as in Eskimo. Diffusion thus may play some role in the differentiation to be found in the Na-Dene phonological structure (Eyak and Haida at either end shading off somewhat into the context) as well as in its uniformity.

consonant systems of Proto-Athapaskan, Eyak, Tlingit and Haida, than for any correlation between the use of labrets and the lack of labials.