How syntax and phonology d(e)r ive (Na-Dene) morphology
James Crippen & Rose-Marie Déchaine
University of British Columbia

Na-Dene languages are famous for their morphological complexity. This is reflected by the fact that both syntactic [1–7] and phonological analyses [8–12] employ large prespecified templates. The template for Tlingit in (1) comprises four prefix domains – PREVERB, DISJUNCT, CONJUNCT, CLASSIFIER – that combine with a verb STEM, with the latter including a Root and autosegmental ‘stem variation’. Such templates are problematic for phonology (opaque segmentation), morphology (arbitrary affix ordering), syntax (indeterminate constituency), and semantics (unpredictable scope). The template problem also extends to interface relations. For example, syntactic treatments – whether head-initial [2,3] or head-final [4–6] – require ad hoc reordering by syntactic and/or PF movement. We adopt an analysis that invokes only conceptually necessary and completely general (‘vanilla’) syntactic and phonological mechanisms. In the syntax: (i) derivation by phase; (ii) Spec-Head-Comp ordering [13]; (iii) in situ prefixation (prefixes attach without head movement [14]). In the phonology: (i) prosodic evacuation of XPs [15]; (ii) metrical syllabification of consonant-only [C-] prefixes. Our syntactic analysis together with prosodic contraints generates a straightforward left-to-right parse that derives all of the surface phenomena of a Tlingit verb form. From this analysis the traditional verb template in (1) can be predictably derived from the structure in (2), with (3) illustrating a maximal expansion of this structure.

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\begin{align*}
(1) & \quad \text{PREVERB DISJUNCT CONJUNCT CLASSIFIER STEM} \\
(2) & \quad [\text{AspP Mod}=[\text{AspP Do}^- [\text{AspP VceP Ds}- \text{VceP} \quad [\text{VP vS} \quad [\text{EP Ei}-[\text{VP <Do} [\text{V var} \sqrt{\text{I}}])]])]
\end{align*}
\]

(3) \quad \text{yán-de yax yakagakwás.eé}
\quad \text{ján-té=jáχ= ø- j- kʰ- k- w- k- q- χ- t- s- ø-Hµ- } \sqrt{\text{i}}
\quad \text{ADV-P= ADV= 3O-N- N_round-RFLX-IRR-ASP-MOD-1SG.S-Vce-v}- \text{E- VAR- } \sqrt{\text{COOK}}
\quad \text{‘I will cook them (small round) all up completely for myself’}

1. Syntactic derivation. The merge of [\text{V var} \sqrt{\text{Root}}] then merges with an argument to form \text{VP} [17]. The maximal \text{VP} merges with \text{E} (eventuality \text{qua} Inner Aspect [16]) which hosts the state-marking \text{I}-component [17]. The minimal Tlingit verb \text{EP} is intransitive and stative. Little \text{v}, which hosts the \text{S}-component, merges with \text{EP} to derive transitive and applicative verbs [17,18]. \text{Voice}, which hosts the \text{D}-component, merges with \text{vP} to derive middle, passive, and antipassive [17,19,20]. \text{Asp} then merges with \text{VoiceP} and specifies (im)perfectivity. \text{Do} raises to \text{Spec,Asp} as required by an EPP-feature on \text{Asp}; it is this movement which defines \text{AspP} as a phase edge in Tlingit. Finally, \text{adverbal} modifiers adjoin to \text{AspP}, predictably iterating adjunctively. Not shown in (2) is the full expansion of the clause, which can contain overt suffixal \text{T} and \text{C}. These are introduced as head-intial phrases, but as phonological enclytics they force leftward movement of \text{AspP} to \text{Spec,TP} (4a), and leftward movement of \text{TP} to \text{Spec,CP} (4b).

(4) a. [\text{TP} [\text{AspP} ... ] [=T <\text{AspP}>]] \quad \text{b. [\text{CP} [\text{TP} ... ] [=C <\text{TP}>]]}

2. Prosodic constraints. The verb in (3) is pronounced as shown in (5) with \text{ } for domain edges.

(5) \quad [\text{io} (\text{ján.té}) (\text{‘jáχ}) (\text{já.kʰa}) (\text{kà[kʰw.qʰw][s]})(\text{‘fí})]
\quad \text{spellout of (3)}

Phasal spell-out of \text{AspP} evacuates DPs, with D pronouns (e.g. \text{χ}- 1SG.S) predictably not evacuated. \text{Preverb} proclitics, which adjoin to \text{AspP}, are footed right-to-left. \text{Disjunct} prefixes, a cluster of D and N formatives in Spec,\text{AspP}, are all underlyingly consonantal but are syllabified via
[a]-epenthesis and footed. **Conjunct** prefixes in **AspP** – the heads of the verbal spine as well as the subject D raised from v – are likewise a succession of consonants. The **conjunct** domain is maximally disyllabic, with the left edge preferably syllabified as the coda of a preceding syllable whether part of the word or not. **Classifier** prefixes – the D, S, and I-components – spell out **Voice**, v, and E. They are are prosodified either as [CV] or the coda of a preceding syllable [17]. In our analysis, epenthesis – not syncope [contra 21,22] – rescues stranded [C]s in the **disjunct**, **conjunct**, and **classifier** domains, as in Dene languages [23]. The **stem** spells out √Root – maximally [CV] or [CVC] – and the verbal head V, and bears the primary word stress. The V sister of √Root corresponds to autosegmental stem variation: it determines vowel length and tone, and aligns to the right of the √Root, sometimes surfacing as a suffix for phonological reasons [24].

4. **Consequences**. Our approach derives all Tlingit verbs and easily generalizes to other Na-Dene languages like Navajo. A key feature of our analysis is that we appeal to neither syntactic head movement [contra 6], nor to phonological head reordering [contra 5]. Rather, prefixes (qua proclitics) attach in situ while suffixes (qua enclitics) trigger phrasal (XP) movement, deriving (6). Only XP movement is in play: DPs are evacuated from AspP; TP and CP undergo leftward movement. This falls directly in line with arguments that Algonquian [14] and Iroquoian [25] verb forms are derived via XP-movement rather than head movement. More broadly, we contribute to the growing set of studies that show that head movement is conceptually unnecessary.

\[(6) \quad [\text{CP}_{\text{TP}} \text{[AspP prefix*-prefix*-prefix*-stem]} = T] = \text{C}]\]