Design Issues in Athabaskan Dictionaries

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1   Overview

In this article I discuss two issues which arise in the construction lexical entries for verbs in bilingual dictionaries of Athabaskan dictionaries. These two issues are the representation of discontinuity in verbal entries, and the choice of headword.

I will illustrate the discussion with examples from traditional printed dictionaries with Athabaskan-English and/or English-Athabaskan sections, generated from a database (i.e. not stored in a word processing program).[1] But these issues do not vanish by selecting a different kind of media for presentation: they still arise (or should) in an online dictionary.

2   Discontinuity

I will begin with an example of discontinuity from Witsuwit'en, a dialect of Babine-Witsuwit'en, which is spoken in western central British Columbia.

As discussed in Hargus 2007, Witsuwit'en verbs contain abundant productive morphology, abundant even by the standards of Athabaskan languages generally. Every regular verb can be inflected in the four 'modes', imperfective, perfective, future and optative, for one of seven subjects (six non-null) and one of two polarities (positive or negative). The upshot is that every regular verb has 56 forms, and this is when counting only the most productive inflectional morphemes just mentioned, and not other morphemes such as the iterative prefix, inceptive prefixes, pronominal prefixes, noun class prefixes, etc. The question then arises as to which of these 56 forms should be included in the dictionary. This issue has already been noted by Munro 2002 for Navajo. She notes that 'a language like Navajo, in which ten or more separate prefixes may often be added to a root to produce a pronounceable verb, has so many possible words that the decision of how to list them in the dictionary raises innumerable problems for the lexicographer.'

For example, consider some forms of the Witsuwit'en verb 'pick berries while stationary', shown in (1).[2]

(1)   Some forms of 'pick berries while stationary'
a. **c'oniyïn**, **c'oyïn**   'she's picking berries'
b. **so' tsalhtsë uniyïn**   'she's good at picking cranberries'
c. **unïnyïn**   '(you) pick berries'

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[2]Witsuwit'en forms are cited in current orthography (see Hargus 2007 on the evolution of this writing system): **i** = [ə], **ï** = [i], **ë** = [ɛ], **lh** = [ɬ]; **g c c'** are palatal stops, **gg k k'** are uvular stops.

d. **digï ts'oniyïn** 'we're picking huckleberries'
e. **wec'its'onïyïl** 'we didn't pick berries'
f. **digï ts'ontayïlh** 'we're going to pick huckleberries'
g. **c'onudityïn' wika'dit'ah** 'we (du.) are trying to pick berries'

As should be well known to readers of this article, despite the seemingly great variety in the forms given in (1), they all have a common denominator. In the sentences containing 'pick berries', there are certain obligatory elements: (1) an object: **c'-** unspecified, **digï** 'huckleberry', **tsalhtsë** 'cranberry'; (2) a prefix having the form **o-** or **u-**; (3) some form of the stem, **yïn**, **yïn'**, **yïl**, **yïlh**. Some of the forms in (1) also contain an optional element, the prefix **n-** round. The prefix **o/u-** may be separated from the stem, as in (1)f., where not only **n-** round but also **ta-** future (which really consists of two prefixes **t-** future/inceptive and **a/i-** future) intervene. The object, if prefixal, may be separated from the prefix **o/u-** by other elements, as in (1)e., where the intervening prefix is **ts'-** 1pS. In short, the discontinuity problem may be summed up as follows: Athabaskan verbs consist of pieces. The lexicographer of an Athabaskan language who desires that lexical entries for verbs faithfully mirror the linguistic structure of that language thus has a duty to show the pieces (somehow).

In Hargus in preparation, a portion of the lexical entry for 'pick berries while stationary' is given in (2):

(2)   Current lexical entry for 'pick berries while stationary' in Witsuwit'en
O+u+yïn *v.* pick O (berries) while stationary. (*commonly occurs with **n-** round object*)

The 'O' in the lexical entry and the gloss in (2) abbreviates 'Object', as is customary in some recent dictionaries of Athabaskan languages (e.g. Ahtna (Kari 1990), Koyukon (Jetté and Jones 2000)), essentially showing that 'pick berries...' is a transitive verb. The 'O' in the Witsuwit'en lexical entry also shows the position of object inflection with respect to other obligatory verbal elements, in the case of prefixal object inflection. (What the entry in (2) does not represent is the systematic (predictable) variation between **u-** and **o-**, common to all verbs with the prefix **u-**. In this respect, the entry in (2) is in the Chomskyan tradition of separation of grammar and lexicon, as opposed to a network approach in which grammar is projected from more fully fleshed out lexical structure, as described in Bybee 2001.) Many entries for verbs in Athabaskan dictionaries choose to show the pieces in some way. In addition to the Ahtna and Koyukon dictionaries mentioned above, the Young and Morgan 1992 dictionary of Navajo also presents verbs as discontinuous entities.

While (2) is a linguistically adequate entry, the problem is that the entry (2) is not a word but an unpronounceable string. Not only does the entry in (2) contain non-word linguistic elements, it also contains the symbol '+', which has no linguistic content. Consequently, in a dictionary of an Athabaskan language that seeks to includes audio or video recordings of headwords, as many dictionaries currently do, the linguistically most adequate verbal lexical entries, unlike lexical entries for other parts of speech perhaps, cannot be recorded as such.

Some alternatives to (2) are shown in (3). All of the lexical entries in (3) contain hyphens instead of the plus sign separating linguistic formatives---the hyphen seems less prominent than

the plus sign and therefore perhaps less intimidating than the plus signs. (3)a. is identical to (2) except for hyphens instead of plus signs. It contains essentially the same (unpronounceable) information. (3)b. contains more unpronounceable information, the symbol 'G' (for 'gender') instead of the linguistic element **n-**. This would be a linguistically more adequate option than (2) or (3)a. if it turns out that **d-** as well as **n-** are possible verb prefixes.[3] (3)c.(or possibly **O-u-(n/d-)yïn**) is an alternative to the comment included with (3)a. (3)d. (or possibly **u-(n/d-)yïn**) contains fewer unpronounceable symbols, leaving out the O and expressing the transitivity of this verb via lexical category designation, *vt*, rather than simply *v*. But (3)d. contains less information than (3)a. in that by leaving out the 'O', it does not show the position of object inflection when prefixal.

(3)   Some alternative lexical entries for 'pick berries while stationary' in Witsuwit'en
a. **O-u-yïn** *v.* pick O (berries) while stationary. (*commonly occurs with **n-** round object*)
b. **O-u-G-yïn** *v.* pick O (berries) while stationary.
c. **O-u-(n-)yïn** *v.* pick O (berries) while stationary.
d. **u-(n-)yïn** *vt.* pick (berries) while stationary.

Another type of alternative to the entries in (2) and (3) is to ignore discontinuity altogether. That is, instead of showing the pieces of a verbal lexical entry, the dictionary might provide a real word citation form from which all other forms can be predicted, perhaps the first person singular perfective or first person plural perfective. In the case of 'pick berries...', the first person plural is sufficient to allow a sophisticated user to predict the other forms of the paradigm:

(4)   Alternative to discontinuous lexical entries: citation form
c'its'onïnyïn' ~ **c'its'onyïn'** 'we picked berries'

The form **c'its'onïnyïn'** by itself could be an n-perfective verb, but the inclusion of the variant **c'its'onyïn'** shows that the medial **n-** in syllable onset position is **n-** qualifier, and that this must be an e-perfective verb. In Witsuwit'en as a whole, there is no single inflectional form from which all other subject-inflected forms can be predicted. Of course, information about conjugation class in the perfective can and probably should be provided in some other way, such as via one of the alternatives in (5):[4]

(5)   Including information about conjugation class in lexical entry
a. Discontinuous lexical entry   **u-(n-)yïn (e-)** *vt.* pick (berries) while stationary.
b. Citation form lexical entry   **c'its'onïnyïn'** ~ **c'its'onyïn' (e-)** 'we picked berries'

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[3] **d-** perhaps in 'pick leaves' (Jim Kari, p.c.).
[4] Or conjugation class in the perfective could be shown in some other, less direct fashion, such as by grouping derivatives under the heading 'durative', which entails **e-** conjugation in the perfective.

Another type of alternative to representing the verb in its pieces in an Athabaskan dictionary is to provide a random, representative form of 'pick berries', as in (6), in which a third person singular imperfective form is embedded in a sentence:

(6)   Representative form as lexical entry for 'pick berries while stationary'
so' tsalhtsë uniyïn   'she's good at picking cranberries'.

This latter approach to lexical entries for verbs in Athabaskan languages is very common in dictionaries with no Athabaskan-English section (e.g. Elford and Elford 1998 dictionary of Dene Sųłiné, or MacAlpine et al. 2007 online dictionary of Deg Xinag dictionary).
        Consider a sample of ways in which the verb 'steal' is represented in Athabaskan dictionaries shown in (7). In all Athabaskan languages, 'steal' consists of not only a root (the final syllable in the verb) but also a prefix *n-*, a 'thematic' prefix, as such prefixes are generally known in Athabaskan linguistics (see e.g. Rice 1989). In fact, Leer 1987:277 reconstructs Proto-Athabaskan *n+0+'i: ɬ* for 'steal'. A linguistically faithful lexical entry for the verb 'steal' in any Athabaskan language should therefore show that both pieces of the verb, root and prefix, are associated with the meaning 'steal'. Of the lexical entries shown in (7), only the first two---Ahtna and Navajo---represent the discontinuous nature of the verb.

(7)   'steal' in several languages[5]
Navajo (Young and Morgan 1992, 252 ff.)
        …   ni-(0/si)… 'to steal or pilfer O'. Nish'įįh/né'į́į́'[6]

Ahtna (based on Kari 1990: 92)
        O+n+0+'ii … steal O. inez'iin he stole it

Carrier (based on Antoine et al. 1974: 38)
        'undunut'íh (v); (-t'ih): he is stealing [for himself]

South Slavey (based on Howard 1990)
        # ets'eneʔįh   /   zhenéʔį   /   enuʔįh[7]
                           enaʔį

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[5]Kari 1988 provides an excellent and detailed classification of various types of Athabaskan dictionaries compiled as of 1988. He distinguishes first of all between (1) English (etc.)-Athabaskan dictionaries and word lists, (2) Athabaskan-English dictionaries, and (3) comparative word lists and dictionaries. He distinguishes further types among category (1): 'alphabetical' and 'topical'. Category (2) distinctions noted by Kari consist of (a) 'word initial alphabetization', (b) 'mixed word initial-stem initial alphabetization', (c) 'stem initial alphabetization, separate sections for word categories', (d) 'stem initial alphabetization, integrated word list'.
[6]The first form is first person singular imperfective 'I'm stealing it', and the second form is first person singular perfective 'I stole it'.
[7]The Slave forms shown in the entry are described by Howard (p. v) as 'present tense / past tense / intentive tense'. The 'present' (usually called imperfective in Athabaskan linguistics) form includes 'the impersonal prefix' *ts'e-*, and the 'past' (usually called perfective) form includes the third person singular direct object prefix *zhe-*.

Deg Xinag (based on MacAlpine, Taff et al. 2007)
    Gini'eyh [JD+ED] lit. S/he steals.
        Niłtreth dangan xał ye gini'eyh. [JD+ED] Wolverine steals from the trap.
        Dlen yeno'eyh. [JD+ED] The mice will steal it.

The problem with linguistically adequate entries for verbs in Athabaskan dictionaries, as noted above, are the difficulties they pose for non-linguist users. Patrick Marlow (p.c.) notes that users of the *Koyukon Dictionary* (Jetté and Jones 2000), which also posits abstract lexical entries for verbs, have difficulty looking up words in the Koyukon-English section, and it is not uncommon to find users' dictionaries littered with post-it notes marking favorite lexical entries. It is perhaps significant that the Carrier dictionary, which lacks a skeletal representation of the verb, was compiled by a group of non-linguist native speakers of Carrier (with two linguist-missionary advisors).[8] The entry for 'steal' in the South Slavey dictionary also fails to show what all forms of this verb have in common.[9]

Consider the plight of a learner of an Athabaskan language who wanted to say some form of 'pick berries'. The user would turn to the English-Athabaskan section, and might find something like what is shown in (8):

(8)   Entry under 'pick' in English-Witsuwit'en section of Hargus in preparation:
pick
    berry pickers: **nididïlhnï** (<ye).
    pick O (berries) while stationary: **O+u+yïn** (<yïn).
    pick up P, go back for P: **P+k'i+ne#D+ye/'as/dïlh** (<ye).
    sg./du./pl. go berry picking, go look for berries: **d+D+ye/'as/dïlh** (<ye).

The learner might well wonder what to do with (how to pronounce) **O+u+yïn**. Traditionally, the expectation is that the learner would use '(<yïn)' in the above list to find 'pick berries...' in the Athabaskan-English section of the dictionary and find out more about **O+u+yïn**. (9) shows what the Witsuwit'en-English section contains for **O+u+yïn**.

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[8]The second author of the *Koyukon Dictionary*, Eliza Jones, is also a native speaker of an Athabaskan language, but she holds a Ph.D. from the University of Alaska Fairbanks.
[9]The compiler, Phil Howard, is described on the SSILA web site (http://linguistics.buffalo.edu/ssila/books/indbook/b431.htm) as follows: 'Howard spent 35 years in the area, first as a missionary and later as a Canadian civil servant...'

(9)   Current entry for 'pick berries...' in Hargus in preparation
O+u+yïn *v.* pick O (berries) while stationary. (*commonly occurs with **n-** round object*)
     dur **c'oniyin, c'oyïn** she's picking (berries); **c'its'oniyïn** we're picking berries (*impf*
        1s **c'onisyïn**, 2s **c'onïn-**, 3s **c'oni-**, 1d **c'onidit-**, 1p **c'its'oni-**, 2p **c'oniwh-**,
        3p **c'ooni-**) …
       pass **'usa bï c'otyïn** berries are picked in pots (LM/DR)
     dist **'et 'awet nik lha'ts'idit'iyh. Ts'iyewh nit'ay nts'oniyïh. Ts'iyewh digï nts'oniyïh
        'et 'awet nekhëlh c'iztildilh** now we were done up there. We had picked all the
        berries. We had picked all the berries and were starting to pack back down (ET)
     cust **ggin 'et digï ts'oniyïh** we used to pick huckleberries there; **dïndze tl'a digï
        'elhikhin zeh hanenityekh. Dïndze digï binis tsoyilnïh 'aw wik'ë'et 'inïlco. 'Et
        wilegh ts'ah digï winis lhay ts'oyïh** high-bush blueberries and huckleberries grow
        back in the same place. Blueberries are sweeter than huckleberries but they're
        smaller. That's why we pick more huckleberries (LM/DR); **digï ts'oniyïh, tl'a tsët
        nik hats'idilh 'et digï tah ts'iyewh lha'aaydilh'iyh** we'd pick huckleberries. When
        we first got up there we'd finish all the huckleberries (ET)
      Bik'it Digï Ts'oyïh *pn.* unnamed hill south of Moricetown. (*lit.* on it we pick
        huckleberries) (*Ut'akhgit territory*)

(9) contains plenty of pronounceable forms of 'pick berries...', including forms embedded in sentences, some from texts ('LM/DR', 'ET'), and an imperfective paradigm. But the entry also contains the perhaps intimidating abbreviations *dur* (durative), *pass* (passive), *dist* (distributive), *cust* (customary), used to group derivatives of 'pick berries' and provide some structure to the entry. Of course, these terms are defined in the introduction to the dictionary, and summarized in a list of abbreviations. But they are terms which are likely to be unfamiliar to the non-linguist user.

       An alternative to presenting discontinuity (=unpronounceability) in the English-Athabaskan section that I am currently exploring in Hargus and Abou in preparation is to include two English-Athabaskan sections in the dictionary. In the case of this Tsek'ene-English dictionary, there are currently two indices, a 'Main index', which contains only real words or sentences, and an 'Index of verbs and verb prefixes', which contains references to potentially discontinuous, linguistically faithful lexical entries. Adapted for Witsuwit'en, the entries for 'pick' in the two types of index would be as shown in (10)-(11). The form of 'pick berries...' shown in the Main index is a first person plural perfective, whereas the form of 'pick berries...' shown in the Index of verbs and verb prefixes is the discontinuous verb as mentioned above.

(10)   Possible entry for 'pick' in Main index
        pick
               we already picked berries: **c'its'onïnyïn'** (<yïn).

(11)   Possible entry for 'pick' in Index of verbs and verb prefixes
        pick
               pick O (berries) while stationary: **O+u+yïn** (<yïn).

Note that if only the English-Athabaskan section in the dictionary were an index similar to the Main index of the dictionary shown above, it would not be satisfactory as a guide to the basic meaning of the verb, unless the example shown above were translated more fully (but more cumbersomely) as 'we already picked berries while stationary'. The semantic inadequacy of the Main index alone is more apparent in the case of a verb with a range of meanings, such as that shown in (12):

(12)   Another lexical entry in Hargus in preparation
        (sa) -'a *v* sun, moon goes, compact, abstract goes.

If the Main index contained the example in (13) as a sample representative derivative of this verb, it would provide no clue as to the range of meanings found in the basic verb:

(13)   Sample derivative of (12)
        hinic ï'alh the message is coming

A problem with the two-index approach is that the second index adds to the length and hence expense of the dictionary. (This is a problem only in a print dictionary, since computer disk space is relatively cheap.) Generating a second index requires extra time of the lexicographer and/or programmer. Finally, a friendlier index might cause users to avoid the Athabaskan-English section altogether, and if so, they would miss important information about the range of meaning found in the verb, as well as other derivatives.

One comment that can be made at this point is that it seems an unavoidable conclusion that Athabaskan languages are simply 'harder' than many other languages (Jeff Leer, p.c.), and that part of the price of learning one of these languages is coming to grips with understanding discontinuity. But Athabaskan languages are not the only languages which exhibit the discontinuity problem, and it is worth taking note of the solution adopted for other languages. Lakhota verbs also consist of pieces. Munro 2002:104 explains the solution used in Munro, Fixico, and Iron Teeth 1999:

> …we use a * to mark the position of inflection…and we write ablaut verbs with a final *a/e*…This type of entry is thus rather abstract, since * and *"a/e"* are not sounds of Lakhota. This degree of abstraction seems useful, but it remains to be seen whether it would be appropriate for a dictionary to be used extensively by native speakers and other nonacademics.

(14) presents some sample verbs with the asterisk-marking convention used in Lakhota:

(14)   Some verbs from Munro, Fixico and Iron Teeth 1999
a*phá/é   'to hit'
ina*xma/e   'to hide'
i*tómni   'to be drunk'

To sum up the discontinuity issue, it is an inescapable fact of Athabaskan linguistics that Athabaskan verbs may consist of pieces. Dictionaries vary in how they represent verbal discontinuity, in either the Athabaskan-English or English-Athabaskan sections, not necessarily adopting the same approach in each section. In general, the more the dictionary faithfully represents linguistic structure as linguists currently understand it, the more abstract the dictionary entries and presumably the more difficult it is for a non-linguist to use the dictionary.

3   Headwords

The second issue which arises with lexical entries for verbs in Athabskan languages is headword choice. This is essentially the decision about what the organizing point of the lexical entry should be. In a traditional printed dictionary or in a browsable online dictionary, it is the element that is alphabetized with respect to other entries. Confronting the headword issue can be avoided in a dictionary whose contents are accessible by search only. Decisions about headword choice are to some extent tied up with decisions about whether and how to represent discontinuity.

Consider more complete versions of the five sample lexical entries for 'steal' which were presented above in (7) without headword. (15) adds the headword that was used in each of the dictionaries to the entries.

(15)   'steal' in several languages, with headwords
Navajo (Young and Morgan 1992, 252 ff.)
$\quad$ 'Į́Į́'$_2$
$\quad\quad$ …   ni-(0/si)… 'to steal or pilfer O'. Nish'įįh/né'į́į'

Ahtna (based on Kari 1990: 92)
$\quad$ 'ii^4
$\quad\quad$ O+n+0+'ii … steal O. inez'iin he stole it

Carrier (based on Antoine et al. 1974: 38)
$\quad$ 'undunut'íh (v); (-t'ih): he is stealing [for himself]

South Slavey (based on Howard 1990)
$\quad$ ʔĮ́H
$\quad\quad$ # ets'eneʔį́h $\quad\quad$ / $\quad$ zhenéʔį $\quad$ / $\quad\quad$ enuʔį́h
$\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad$ enaʔį

Deg Xinag (based on MacAlpine, Taff et al. 2007)
$\quad$ STEAL Gini'eyh [JD+ED] lit. S/he steals.
$\quad\quad$ Niłtreth dangan xał ye gini'eyh. [JD+ED] Wolverine steals from the trap.
$\quad\quad$ Dlen yeno'eyh. [JD+ED] The mice will steal it.

The entries in (15) reflect a range of the design decisions made by Athabaskan lexicographers.[10] One decision is whether there will be an Athabaskan-English section at all. Some dictionaries give up on attempting to represent an Athabaskan language via some Athabaskan element. The Deg Xinag dictionary is an example of this type. Here the headword used to organize the Deg Xinag forms is an English word, 'steal'. The other dictionaries represented in (15) select an Athabaskan element as headword. For the Navajo, Ahtna, and S. Slavey dictionaries, the headword is an Athabaskan root. For the Carrier dictionary, the headword is an Athabaskan word.

Each of these headword choices comes with its own set of pros and cons. Here I focus mainly on the cons associated with each choice.

3.1 Athabaskan root as headword of verbal entry

For the Athabaskan root as headword choice, the chief problem for the linguist/lexicographer is how to recognize a root, and implement that decision consistently across entries. Roots are normally the final and/or stressed syllable in a verb, as in Witsuwit'en **c'oniyïn** 'she's picking berries'. However, in some cases the root is smaller or bigger than the final stressed syllable in an actual verb word. For example, in (16)a. the root is smaller than the final syllable. In (16)b., an element of the root is deleted before a suffix. In (16)c., the root is larger than the final syllable.

(16)   Root not coextensive with final syllable
a. Root (**yïn**) a subset of final syllable   Witsuwit'en   **wec'onisyïn'** 'she hasn't picked berries'
b. Root (**yïn**) not contained in final syllable Witsuwit'en   **wec'onïyïl** 'she didn't pick berries'
c. Root (**stl'i**) larger than final syllable   Deg Xinag   **ngistl'i** 'it's small'

Another class of problem with the root as headword approach to verb entries is the possible lack of consistency with non-verb lexical entries. In Hargus in preparation, the headwords of entries belonging to lexical categories which either do not take prefixes or for which the prefixation possibilities are much more limited than verbs are basically unanalyzed. Some examples are shown in (17)-(19):

(17)   Noun
'a[1]
          'a *n.* fog, mist. **'a hozdlï'** it got foggy; **'a welew** it's not foggy
dinï *n.* man, male, person.

(18)   Number
tak'iy *num* three. **tak'iy k'iy** three birches; **tak'iy yikh 'et wit'iy** she has three houses; **ndu nek biynïlts'ilh? Tak'iy 'e nek biynïlts'ilh** what comes after two? Three comes after two (LM/DR)

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[10]See Kari 1988 for a more complete classification, as discussed in footnote 5.

(19) Verb prefix
ho

    ho# *vpf.* (*mom **0,e***) out, forth.
        mot **dic'ats honye** he went out on the territory…
    ho#n- *vpf.* (***0,e***) start to. (*mom*) *this prefix is not used with ordinary motion verbs; it is not compatible with continuative aspect.*
        clf-mot **'usa hontinïlts'it** the pot started to tip…

Note that in two cases above, the headword is two syllables. The final syllable in **dinï** is stressed, which, in the case of a verb, is an indicator of the root. But I have argued elsewhere (Hargus 2005) that some roots in Athabaskan languages are polysyllabic, with predictable stress. In the case of **dinï**, there are no related forms that could justify an entry for this word which is anything smaller than **dinï**.[11]

On a related note, ideally a meaning should be assignable to a root if it is a valid linguistic construct. But some verbal roots have very abstract meanings, even more so than that given in (12), and for some verbs or denominal derivatives, the verbal root can really only be recognized on the basis of formal patterning with other verbs. Consider the entry for the Witsuwit'en root **'a**^{3} given in (20). Three of the verbs based on this root are listed in (20).

(20)   **'a**^{3}

neu	'a	'a'	'alh	'a'
neuneg	'ah	'al	'atl	'a'

    -'a *v.* linear object is. *some objects which require this root are:* **ts'o** *spruce (if standing),* **lho** *glacier,* **tiy** *trail.*
        neu **ts'o hodïn'a** the spruce is standing; **ts'o howedï'ah** the spruce is not standing; **gwe'ilh nts'oon'a?** where's the bag? **lho tan'a** a glacier flows into the water …
    lh+'a *v.* vegetation is.
        neu **ggit dicin halh'a** the bush is thick there; **'et hayïlh'a** a bush is sticking up there; **talh'a** it (tree) is growing in water
    lh+'a *v.* body part is.
        neu **dekw'ëts nis yilh'a** he's sticking his lower lip out; **tetseniclh'a** I'm sticking my head out; **hotl'awdïclh'a** I'm sticking my butt out; **tse'alh hiyik'it tsenïlh'a** people put their heads on pillows (LM/DR)

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[11]There is a suffix **–nï** 'human plural, non-human singular', but the synchronic semantic connection does not seem strong enough to warrant grouping **dinï** and **–nï** in the same entry.

The noun **'atan'a** 'bay' is also listed as a derivative of **-'a** 'linear object is', but a literal (or even etymological) meaning cannot be given at this time.[12]

The chief problem for the root as headword approach for the non-linguist user is the lack of familiarity with root. Native speakers are probably more comfortable with the choice than learners. Speakers seem to be aware of roots on some level as evidenced by playful, mixed language forms such as those in (21). In (21)a., a bilingual speaker of Witsuwit'en and English has produced a word with Witsuwit'en prefixes but an English verb as root. In (21)b., another bilingual speaker has substituted a Witsuwit'en verb root for an English verb

(21)   English verb substituted for Witsuwit'en verb root
a. **tinec'itas**wash (cf. regular Wit. **tinec'itasggis** 'I'm going to wash (something)' (example noted in Hargus 2007))
b. 'I'm going to go outside and **t'it**.' (cf. regular Wit. **c'itast'it** 'I'm going to smoke (something)')

Along similar lines, note that Fort Ware Tsek'ene has borrowed the English verb *jump* as **–jùm**. A third person singular future inflected form of this verb is given in (22):

(22)   English verb borrowed as Tsek'ene verb root
       k'ìdajùme 'he's going to jump around'[13]

These examples suggest the congruence of Athabaskan verb roots with English verbs in the minds of native speakers. This observation, like many others made in Athabaskan linguistics, should be considered a hypothesis to be tested.

3.2   Athabaskan word as headword of verbal entry

As mentioned above, some Athabaskan dictionaries contain Athabaskan verbs as headwords. One example of this type of dictionary is Antoine et al. 1974, a Carrier dictionary. Phone et al. 2007, a recent dictionary of Jicarilla Apache, also has Athabaskan verb words as headwords.

Using (23) as an example of this type of headword, let us consider some of the problems with this approach.

(23)   A Carrier verb word as headword of verbal lexical entry
       'undunut'íh (v); (**-t'ih**): he is stealing [for himself]

In Antoine et al. 1974, the entry in (23) is alphabetized under its word-initial **'** (glottal stop), along with other glottal stop-initial words, some root-initial and some prefix-initial. The form of

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[12]Thanks to the computational skills of Bob Hsu, a cross-reference to **'atan'a** can be generated in the glottal stop initial headword section in the expected alphabetical order for **'atan'a**. This cross-reference instructs users to find **'atan'a** under **a³**.

[13]Proto-Athabaskan *lə-tlαχd* "spring, leap, jump up" (Leer 1987) has two reflexes in Fort Ware Tsek'ene: **l+tlah** 'go fast, walk fast, walk on trail', **n+l+tlah** 'fly, slide'.

'steal' selected for inclusion in the dictionary just happens to be word-initial. Another form of it might be y-initial, and that form would have been listed under the word-initial **y**. There is thus the potential for much disorganization if more than one form of 'steal' included in dictionary (the forms of 'steal' would not all be listed in one place). For example, in Wall and Morgan 1958, a Navajo dictionary, we find **'ádin** 'there is nothing, none' on p. 3 and **'ádaadin** 'there are none of them' on p. 1. Or we find **łibá** 'gray' on p. 41 and **dinilbá** 'light gray' on p. 29.

Alphabetizing verbs by their word-initial segment also doesn't help the native speaker or the learner find the entry for the Carrier translation of 'steal' in the dictionary, unless verbs are consistently entered one or the other verb prefix (not the case in this dictionary, however).

A further problem with this approach is the failure to show the relationship of **'undunut'íh** to verbs words which share the same root **-'íh**, such as 'sneak'.

3.3   English word as headword of verbal entry

The final type of verbal lexical entry found in dictionaries of Athabaskan languages is the type found in bilingual dictionaries with no Athabaskan-English section. There is a single English-Athabaskan section, and verbs are alphabetized under an English verb. A recent example of this type of dictionary is MacAlpine et al. 2007. Let us consider the entry in (24) for discussion in this section.

(24)   An English verb as headword of Athabaskan verbal lexical entry
STEAL Gini'eyh [JD+ED] lit. S/he steals.

This entry is alphabetized under S in what is, in all fairness, a "learners' dictionary" of Deg Xinag, meaning one that is presumably oriented for native speakers of English. Nonetheless, this type of approach to Athabaskan lexicography may be criticized for not trying to represent the language on its own terms, but only through that of the language of the dominant culture. In this approach, like that of the Athabaskan verb as headword, the relationship of words translated as 'steal' to those of 'sneak' is not shown. One may also ask what kind of training in general or Athabaskan linguistics, apart from transcriptional ability, is required to compile this kind of dictionary. It is not very different from the word lists compiled by the first colonizing explorers and missionaries.

3.4   Headword summary

Each of the three approaches to headwords of Athabaskan verbal lexical entries has its own problems. Organizing dictionary entries under the word-initial segment of a verb can lead to disorganization within the dictionary, if multiple forms of the same verb are listed in the same dictionary, as well as obscuring of the relationships between related words. Organizing lexical entries for verbs using only a non-Athabaskan word fails to represent the language on its own terms. Organizing lexical entries for verbs under roots avoids these problems, but can lead to its own problems, chief among them lexical entries which may be overly abstract. In general, linguists should learn more about the validity of roots through psycholinguistic tests.

4   Conclusions

In this article I have discussed two issues in Athabaskan verbal lexicography, the treatment of discontinuity and the choice of headword. As seen, a variety of solutions to these two problems can be found in recent dictionaries of Athabaskan languages. In the dictionaries of Athabaskan languages which I myself am currently preparing, I lean more towards the approaches found in Kari 1990, Young and Morgan 1992, and Jetté and Jones 2000: organize verbal entries under a verbal root; and show the discontinuity in a verbal lexical entry (but minimize unpronounceable symbols).

Athabaskan dictionaries raise other issues only briefly touched on in this article, such as how much nesting should be contained within lexical entries, where nesting shows linguists' hypothesized relations between words. Beavert and Hargus in preparation is a dictionary not of an Athabaskan language, but of Sahaptin, a Sahaptian language. It is the result of collaboration between myself and Virginia Beavert, a native speaker of the Yakima (Yakama) dialect of Sahaptin. This dictionary contains no nested examples, as Virginia felt that this led to unjustifiable abstractness in some cases.

Ideally, the decisions about these issues should not be made by linguists alone, but by the lexicographical team, usually a linguist working with one ore more linguistically trained or exceptionally talented native speakers, as just described for Sahaptin. The linguist could provide mock-ups or alternative ways of presenting the same linguistic information.

In Hargus to appear I mentioned some of the reasons why descriptive/documentary linguists do not engage in lexicography: lexicography is time-consuming work with no immediate pay-off; current lexicography requires computational skills above and beyond that of the average linguist even if the lexicographer leaves the main programming to a computer programmer.   Another reason which must be given is that unlike grammars, much of the linguistic analysis involved in preparing certain kinds of dictionaries is implicit rather than ever made explicit. This means that dictionaries are particularly fruitful places for what computational linguists call 'data mining'. It thus requires a certain kind of courage to spend years of one's life preparing a dictionary which may be mined by other linguists.

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