# The sound change \*s- > n- in Arapaho<sup>1</sup>

Guillaume Jacques CNRS (Paris)

The sound change \*s > n in initial position in Arapaho is unparalleled in the world's languages, and previous attempts at explaining it have failed to produce a convincing account of its intermediate stages. This article presents two hypotheses to account for the correspondence between PA \**s*- and Arapaho *n*-, taking into account not only the individual steps of this particular proto-phoneme, but the evolution of the whole consonant system. It shows that the change \**s* > *n* in initial position only appears to reflect an unnatural development: it can in fact be explained in terms of a sequence of natural changes and mergers.

Keywords: Algonquian, Arapaho, historical phonology, merger, rhotacism

## 1. Introduction

The historical phonology of Arapaho and Atsina is notoriously complex and typologically unusual. Not only does the sheer number of phonetic changes that have occurred in them make these two languages look very different from Proto-Algonquian (henceforth PA) and all other members of this family, but many of these changes are poorly attested in other languages of the world. One of the most unusual sound changes in Arapaho and Atsina concerns the evolution of PA \**s*, described in a phonetic law which we can call Goddard's law after its discoverer:

PA \*s becomes \*n initially and \*h after a vowel or consonant (which at this point could only be \*?) (Goddard 1974: 107)

<sup>&</sup>lt;sup>1</sup> I would like to thank Ives Goddard, Nathan Hill, Alexis Michaud, Nikolaus Ritt and three anonymous reviewers for useful comments; I am responsible for any remaining errors. This research was funded by the Labex EFL (Empirical Foundations of Linguistics, PPC2, Evolutionary approaches to phonology: new goals, new methods).

Goddard adduced only two examples of this sound change:

- *\*siipiiwi* 'river' > Ar *níícíí*, Ats *níícéé*, compare Ojibwe *ziibi*;
- \*sakimeewa 'mosquito' > Ar nóúbee , Ats nóúbé 'fly', compare Ojibwe zagime.

Goddard's Law implies that the proto-phoneme \*s merged with \*n, \*r, and \*w in initial position, as all of these other consonants have the same reflex. Later, Pentland (1998) added twelve additional examples of this sound change, including both verbs and nouns, putting to rest any doubt as to the validity of Goddard's law. While we will not reproduce here Pentland's etymologies, we propose two new etymologies involving the correspondence of PA \*s- to Arapaho n- (data from Conathan 2006 and Salzmann 1983):

- Arapaho nónoyoo- VII<sup>2</sup> 'to be wrong' comes from PA \*sanak-yaa- (or \**sarak-yaa*). The intransitive inanimate final \*-(y)*aa*- is guite common in Arapaho, as shown by *heyóó* - VII 'to be long' < \**kenw-aa-* for instance. hookoyóó - VII 'to be thick' < \*kespak-yaa- (Goddard 1974: 140) shows the same reflex of \*-ky- across morpheme boundaries.<sup>3</sup>

The initial \*sanak- or \*sarak- is reflected by Ojibwe zanagizi VAI < \*sanakesi-wa or \*sarak-esi-wa 'to have difficulty' with the VAI final \*-esi-. Since the finals \*-yaa- and \*-esi- often generate pairs of verbs with the same initial (Bloomfield 1946), the reconstruction PA \*sanak-yaa- is perfectly possible even if not attested elsewhere. Note that nónoyoo- VII 'to be wrong' is etymologically unrelated to the superficially similar preverb noni- 'wrongly', which should rather be compared to PA \*wani- (Ojibwe wani- 'by mistake').

- Arapaho niiθóun- vTA 'to milk' originates from PA \*sii-θakw-en-. Since such a reconstruction has never been proposed before, a detailed discussion is necessary.

Hewson (1993) compared Ojibwe ziinin- VTA 'to milk' with Menomini seenenen-eew 'he squeezes him in his hand' and Cree VTI siin-eew 'he wrings', and proposed a reconstruction \*siin-en-(eew), with initial \*siinand VTA final \*-en- 'by hand'.

<sup>&</sup>lt;sup>2</sup> There are four main verb classes in Algonquian languages: VII intransitive inanimate verb, VAI intransitive animate verb, VTI transitive inanimate verb and VTA transitive animate verb.

<sup>&</sup>lt;sup>3</sup> cf. Ojibwe ginwaa- 'to be long' and gipagaa- 'to be thick' respectively.

Ives Goddard (p.c.) suggests instead to analyse the Cree form as initial \**sii*- + VTI final \**-en-*. In this view, Ojibwe *ziinin-* comes from \**siin-en-*, having remotivated the form by adding another copy of the final \**-en-*.

Arapaho VTA *niiθóun*- visibly contains the initial \**sii*- > *nii*- and the VTA final \*-*en*- 'by hand', but an additional postinitial has to be posited. The most probable reconstruction of this element is \*- $\theta akw$ -,<sup>4</sup> but it seems not to have any known cognate (Ives Goddard, p.c.).

Postinitials are very common in Arapaho, and their presence obscures the shapes of initial and final stems. Concerning the VTI and VTA finals *-en-* < \**-en-*, Cowell & Moss (2006: 145) point out that 'many TI and a few TA verbs show a modified form of this final, occurring as /V(V)n/. Among his examples, he provides *séyoun* VTA 'to crush', which illustrates an irregular reflex similar to the one found in *niiθóun-* VTA 'to milk'. The irregular form of the final in this verb is caused by the presence of a different postinitial.<sup>5</sup>

With these two additional etymologies, the PA \*s- to Arapaho n- correspondence now boasts 16 examples.

In verb morphology, the phonetic laws would predict an alternation between n- (in unprefixed forms) and h- (in prefixed forms), but analogy has erased any trace of this potential pattern.

While the sound change s- > h- is extremely common, attested in many language families, the change s- > n- in initial position is apparently not attested except in Arapaho and Atsina. This motivates a detailed study of the sound change, because any general theory of sound change has to take rare cases into account and needs to be able to explain how they came about and why they are uncommon.

Apart from Goddard's seminal article, Goddard's law has been the topic of three publications: Picard (1994a), who attempted to propose a path of sound changes to account for the \*s- to n- correspondence between PA and Arapaho/Atsina, Pentland (1998), who presented a series of detailed etymologies illustrating this sound change, and Goddard (2001), who

<sup>&</sup>lt;sup>4</sup> With the intermediate stage \**sii-θakw-en-* > \**siiθakon-*.

<sup>&</sup>lt;sup>5</sup> We propose to reconstruct PA \**šekw-akw-en-* for *séyoun-* vTA 'to crush'. This root is not reconstructed by Hewson, but is found in reduplicated form in Ojibwe *zhishigon-* vTI 'to crush by hand' < \**šelšekw-en-* with the same phonetic treatment as Ojibwe *zhiishiigi-* vAI 'to urinate' from \**šiilšiiki-*, reduplicated form of the initial \**šiik-*. Here we find a distinct postinitial \**-akw-*.

discusses it briefly.<sup>6</sup> Goddard (1998), a later article solving several thorny issues in Arapaho historical phonology and morphology, does not deal with this topic.

The aim of this article is to have another look at the correspondence \*s-: n-, reconstructing several possible chains of sound changes linking PA to Arapaho/Atsina. It is divided into four parts. First, we present relevant background information on PA and Arapaho. Second, we discuss the previous literature. Third, we study in detail one of the previous proposals. Fourth, we put forth an alternative hypothesis to explain the evolution of the consonantal system from PA to Arapaho.

#### 2. Proto-Algonquian and Arapahoan languages

#### 2.1. Proto-Algonquian consonants

Proto-Algonquian is reconstructed following Bloomfield's (1946) model with a few minor amendments by Siebert and Goddard. While the system of phonological oppositions is relatively well reconstructed, the exact phonetic values of the proto-phonemes and clusters are still controversial in some cases. In the present article, we adopt Goddard's (1998) reconstruction of proto-Algonquian, using \**r* instead of \**l*, \**-sp*- and \**-sk*- instead of Bloomfield's \**-xp*- and \**-xk*- and \**-rk*- instead of \**-ck*-.

Given the limited scope of this article, we will only focus on two problematic proto-phonemes: \*r and \* $\theta$ .

PA \**r* has a wide variety of reflexes among languages, and even Cree dialects differ considerably from one another with respect to their reflexes of this consonant. The following reflexes are attested: n (the most common one), *l*, *j*,  $\eth$  and *t*. Bloomfield proposed to reconstruct it as \*[l]. However, there is evidence for reconstructing \*[r] instead (see Goddard 1979 and Goddard 1994), in particular the fact that early Miami-Illinois has R which becomes L in the later language (Costa 2003: 41).

Another problematic proto-phoneme is \* $\theta$ , whose reflexes in modern languages include *n*, *t*, *l* and  $\theta$ . Bloomfield himself suggested that this consonant could have been either \*[4] or \*[ $\theta$ ] in the proto-language, and Picard (1984) supported the reconstruction \*[4], but Goddard(1994) argues

<sup>&</sup>lt;sup>6</sup> Picard (1994b) also discusses these sound changes briefly. See Goddard (1995) and Pentland (1997) for (quite critical) reviews of Picard's book.

against it, because if \*[r] is reconstructed instead of \*[l] for the previous phoneme, \*[4] has little advantage.

The hypotheses presented in this article, however, would still be valid if the reconstructions \*[1] and \*[4] are chosen favour of \*[r] and  $*[\theta]$ .

#### 2.2. Nawathinehena

The historical phonology of Arapaho/Atsina cannot be completely understood without taking into account their closest relative, the poorly attested Nawathinehena, only known from a short wordlist in Kroeber (1916).

In spite of these limited data, Nawathinehena displays some interesting differences to Arapaho/Atsina as regards several consonant correspondences. The examples in Table 1 illustrate the sound changes that are relevant to the present article in either Arapaho and Nawathinehena.<sup>7</sup> Goddard (1974) already knew these correspondences:<sup>8</sup>

In Nawathinehena PA \*s, \*l, and \* $\theta$  fall together to [t], a development reminiscent both of the partial falling together of \*s and \*l in Arapaho-Atsina and of the change of \*l and \* $\theta$  to /t/ in Cheyenne.

Consonant	Meaning	Proto-Algonquian	Arapaho	Nawathinehena
*θ	arrow	*aθwi	hóθ	hot
*θ	dog	*aθemwa	héθ	hatam
*w	rabbit	*waaposa	nóóku	mā"kut
*ny	four	*nyeewanwi	yéín	niabaha'
*ny	five	*nyaaθanwi	yooθón	niotanaha'
*s	river	*siipiiwi	niicíí	titc
*r	man	*erenyiwa	hinén	hiten
*t	mouth	*metooni	bétii	matīn
*?s	son	*nekwi?sehsa	neíh?e	neicta'
*?s	stone	*a?senaapeewa	hoh?onóókee	haxta <sup>n</sup>
*t	cottonwood	*asaatwiya	hohóót	hoxtoxt

Table 1. Arapaho and Nawathinehena

<sup>7</sup> The proto-Algonquian reconstructions are taken from the articles by Goddard, Pentland and Picard cited above, with slight emendations.

 $^{\rm 8}\,$  In this quote, as in all of his publications prior to his 1998 article, Goddard uses \*l instead of \*r.

Goddard (2001) further proposes that in Nawathinehena \**s* changed to \**z* in all positions, then merged with \**r* and eventually changed to \**t*. This hypothesis will be evaluated in the following sections.

Nawathinehena, in spite of being relatively close to Arapaho and Atsina does not share with these languages the sound changes affecting \*w, \*s, \* $\theta$ , \*r.

However, the Nawathinehena forms were recorded in a pre-phonemic transcription, and require some degree of interpretation before comparison with Arapaho can be undertaken. The main problem here concerns the reflex of \**îs*. In Arapaho, it corresponds to *hî*, and (Goddard 1974: 110) proposes a metathesis \**îs* > \**îh* > *hî*. In Nawathinehena, \**îs* is reflected by both <ct> and <xt> . However, it is unlikely that this difference in transcription reflects a real phonemic contrast.<sup>9</sup> <ct> (transcription of a sound like [*j*t] or [*c*t]) occurs after a front vowel, and a preaspirated stop [*h*t] or velar fricative + stop cluster [xt] could have had a palatalized allophone after front vowels. Thus, it would seem possible to posit a change\**îs* > \*[xt] in Nawathinehena.

However, the example of 'cottonwood' \**asaatwiya* transcribed as <hoxtoxt> shows the same orthographic group <xt> as a reflex of both \**s* and \**t*, where simple <t> would be expected. Thus, we should not over-interpret the transcriptions <ct> and <xt> in the words <neicta'> 'son' and <haxta<sup>n</sup>> 'stone': Kroeber's transcription is visibly non-systematic and the groups <ct> and <xt> could simply point to a specific phonetic realization of simple /t/ between vowels, and not indicate a cluster at all. In any case, the \**s* > *t* change occurred not only in word-initial position and between vowels, but also within clusters.

As follows from the above discussion, the correspondences between Arapaho and Nawathinehena for the consonants studied in this article are set out in Table 2.<sup>10</sup>

<sup>&</sup>lt;sup>9</sup> Kroeber (1916: 82) himself mentions this problem: "The x or h so frequently written before t, ts, and s in Nanwuthinähänan causes the suspicion that the informant was exaggerating a real or imaginary greater degree of aspiration, either of vowels or of consonants, than he believed Arapaho to possess. It seems somewhat doubtful whether full xt, xts, and xs were really spoken." I wish to thank one anonymous reviewer for pointing this out to me.

<sup>&</sup>lt;sup>10</sup> Atsina only differs from Arapaho here by its reflex of  $*\theta$ , but (Goddard 1974: 114) shows that early Atsina has a dental affricate  $*[t\theta]$ , suggesting a change  $*\theta > *t\theta > t$  in this language.

PA	Arapaho	Atsina	Nawuthinehena
*w	n	n	m
*у	n	n	?
*n	n	n	n
*ny	у	у	ni
*s	n/h	n/h	t
*?s	h?	h?	t
*r	n	n	t
*θ	θ	t/t <sup>y</sup>	t
*t	t	t/t <sup>y</sup>	t

*Table 2.* Correspondences between Arapaho and Nawathinehena

#### 3. Previous contributions

Goddard does not comment on the \**s*- to *n*- sound correspondence in detail, but suggests that it might be related to the \*r > n sound change, though he is not specific about how the merger between these two protophonemes took place:

The obvious parallelism of (10a) [\*s > n] and (10b) [\*l > n] makes it convenient to treat them together, though the history of these sounds may have been more complex than is here implied. (Goddard 1974: 107)

Picard (1994a) attempted to explain the seemingly aberrant sound change \*s - > n- in terms of *natural* and *minimal* sound changes, that is steps involving only changing one distinctive feature and attested in other languages.

His reconstruction of the phonetic pathway from \**s*- to *n*- is the following:

(1) \*s - > \*h - > \*c - > \*y - > \*l - >n -

He assumes first that the sound change \*s > h present after vowels and consonants in Arapaho also occurred initially, but believes that in this position \*h- was palatalized to \*c-, which subsequently merged with \*y-. Picard then adopts Goddard's insight and assumes a merger of \*y- (from \*w-, as there were no initial \*y- in proto-Algonquian) and \*l- in \*l-. Finally, he assumes another merger, namely one of \*l and \*n in \*n.

Fengke		Asher	Meaning	
Phonetic	Phonemic	Phonetic	Phonemic	-
hỹ	hỹ	hỳ	hỳ	red
çjù	hỳ	çỳ	çỳ	tired
hĩ	hĩ	çī	hī	man
çī	hī	ÇĪ	hī	rice

*Table 3.* Phonemicization of the contrast h and c in Naxi

Although most of the steps proposed by Picard seem relatively plausible, the change \*h- > \*c- is problematic. The sound changes such as h > [c]or h > [c] are attested, but they usually only occur in the context of front vowels. Naxi dialects in particular give a beautiful example of such an evolution, as set out in Table 3 (see Michaud 2006).

In the Fengke dialect of Naxi, the phoneme /h/ is realized as [ $\varsigma$ ] before non-nasal front vowels and [h] elsewhere. In the Asher dialect, nasal vowels were lost, but the former contrast between nasal and non-nasal vowels was transphonologized as a contrast between /h/ and a newly created phoneme / $\varsigma$ /.

However, a general change from h to c before all vowels is not attested in any language.

It is therefore problematic to posit this step for words such as *\*sakimeewa* 'mosquito' > Arapaho *nóúbee* or *\*saakesiwa* 'he emerges out' > Arapaho *nooehi*- (Pentland 1998: 314), in which no front vowel ever occured after the initial consonant at any time of the history of Arapaho.

Pentland's (1998) article is focused on confirming Goddard's law, so he discusses the intermediate steps of the \*s- > \*n- evolution in less detail. He points out that although the merger of initial \*s and \*r as n has something like a parallel to the merger of \*s and \*r as second element of consonant clusters, the two changes are certainly unrelated, as the latter is shared by many Algonquian languages and probably much more ancient. Pentland's interpretation of the \*s- > n- sound correspondence is not markedly different from Picard's: he suggests that \*s- merges with \*h-, and then \*h- and \*y- merge in voiceless  $*[l_i]$  word-initially (Pentland 1998: 318).<sup>11</sup> This explanation suffers from the same problems as Picard's.

 $<sup>^{\</sup>rm n}\,$  He cites Pentland (1979: 354) concerning this idea, but this reference is not available to me.

51

### 4. Rhotacism

A more promising interpretation of the correspondence between PA \*sand Arapaho n- was proposed by Goddard:

One possibility [to explain the correspondences PA \*s- to Arapaho/Atsina n- and Nawathinehena \*t-] is that \*s shifted to \*z in Nawathinehena, and word-initially in Arapaho-Gros Ventre; then \*z shifted to \*r; and then \*r underwent its regular shifts to Nawathinehena [t] and Arapaho-Gros-Ventre n. (Goddard 2001: 76)

Table 4 charts Goddard's proposal and attempts to make the relation between the involved changes clear. Shaded areas indicate mergers.

PA	1	2	3	4	5	6
*n					> n	
*w	> *y			>*r	> n	
*s		> *z	> *r		> n	
*r					> n	
*θ						> 0
*t						> t

*Table 4.* Development of some Arapaho consonants in initial position, hypothesis I

This table closely follows Goddard's proposal, except that we added an intermediate stage \*y- > \*r- > \*n- instead of assuming a direct shift \*y- > \*n-. One anonymous reviewer objected to this hypothesis, citing Cheyenne as an example of a direct \*y > n change. In Cheyenne, proto-Algonquian \*y (between vowels) merged with \*r,  $*\theta$  and \*t as t, but a secondary pre-Cheyenne \*y was created from \*Cw and \*Cy clusters (Goddard 1988: 348). This secondary \*y later changed to modern Cheyenne n. However, no data in Cheyenne rules out the path pre-Cheyenne \*y > \*r > n, since in pre-Cheyenne the change proto-Algonquian \*r > \*t had already occurred. For instance, using the noun \*keriwa 'golden eagle',<sup>12</sup> the intermediate stages would be: (the pre-Cheyenne stage 1 form \*kyete is Goddard's):

Proto-Algonquian	Pre-Cheyenne 1	2	3	Modern Cheyenne
*keriwa	*kyete	*yete	*rete	netse

<sup>&</sup>lt;sup>12</sup> For the reconstruction *\*keriwa* rather than *\*kenriwa*, see Goddard (1988: 356).

PA	1	2	3
*n			> n
*w			> m/w
*s	> *z	> *r	> t
*r			> t
*θ			> t
*t			> t

*Table 5.* Development of some Nawathinehena consonants in initial position, hypothesis I

I know of no uncontroversial attestation of a direct sound change \**y*- > \**n*- in any language, and in any case no positive evidence contradicts the pathway \**y* > \**r* > *n* in Arapaho.

A similar table can be proposed for Nawathinehena; see Table 5.13

In the following, we return to the sound changes in Arapaho and Atsina, as charted in Table 4.

Steps 1, 3, 4 and Step 2 are independent of each other, and their relative order could be reversed in principle. Before step 2, \*s changed to [h] in all non-initial positions. This change is not exceptional; for instance, in Viet-Muong languages, \*s- (which was either preserved or changed to t- in initial position) becomes -h or a tone in coda position (see Ferlus 1998) for instance).

**Step 1** is not controversial, and is reminiscent of the sound change \*w- > \*y- word-initially in Hebrew (Joüon & Muraoka 2006: §26).

Step 2 is the phonetic voicing of \*s-. In languages without a voicing contrast, such as most modern Algonquian languages (and also Iroquoian languages such as Mohawk), obstruents are commonly pronounced as voiced between vowels or in nasal + obstruent clusters, and sometimes even word-initially when preceded by a word ending in vowel. The only context in which obstruents are never voiced is in clusters with another unvoiced obstruent.

**Step 3** is the rhotacisation of \*z into \*r. Rhotacisation is well-known from Germanic (see e.g. Lass 1994: 27), Latin, Turkic. In Indo-European

<sup>&</sup>lt;sup>13</sup> Notice that none of these sound changes are shared with Arapaho/Atsina, since \*s > t occurs in all contexts, not only word-initially.

and Turkic, rhotacism is only attested word-internally or finally, never initially, as can be verified in Kümmel (2007: 80–81).

This is, however, an artefact of the structure of the phonological systems of these languages. In Germanic, the only origin of \*z is the effect of Verner's law, but this law never affects the initial consonant of a word. In Latin, the change s > r only occurs between vowels. In Turkic (according to some specialists), \*z was restricted to word-internal and word-final positions. Thus, these languages do not constitute counter-evidence as to the possibility of a change \*z > r in word-initial position.

Uncontroversial examples of rhotacism in word-initial position are rare. Vietnamese constitutes however a probable one, as shown by Ferlus (1982):

(2) \* $ksa\eta$  'tooth' > \* $za\eta$  > rang

Proto-Viet-Muong \*Cs- initial clusters become *r*- in modern Vietnamese, probably through a spirantized intermediate stage \**z*.

**Step 4** is the merger of \**y* and \**r* (either only from proto-Algonquian \**r* only or from the merger of \**r* and \**s* after step 2). Such a sound change is attested in Siouan languages (Carter et al. 2006): proto-Siouan \**y* merges with \**r* in *r* in Chiwere, Winnebago, Crow and Hidatsa. It may be an areal feature; Crow was in contact with Arapaho during the historical period, but much less is known about the prehistory of these peoples.

After this general merger, \*r (from \*r, \*y, \*w and \*s) merges with \*n into n. Thus, Goddard's proposal does not posit any unattested sound change and is therefore an acceptable account of the correspondence of PA \*s- with Arapaho n-. If true, it would constitute an interesting rare example of word-initial rhotacism. However, it is not the only logical solution to account for the Arapahoan data.

#### 5. Lambdacism

This section proposes an alternative to Goddard's rhotacism hypothesis.

Instead of supposing a change of \**s* to \**r*, it suggests instead a shift \**s* to \**l*, which implies a different series of intermediate stages.

In this hypothesis, proto-Algonquian \*r changed to \*l very early in Arapaho, and subsequently initial \*s- changed to the lateral fricative \*l-, which then merged with \*l- in \*l-; see Table 6.

		'	•			
PA	1	2	3	4	5	6
*n						> n
*w		> *y			>*1	> n
*s			<del>4</del> * <	> *1		> n
*r	>*1					> n
*θ						> θ

*Table 6.* Development of some Arapaho consonants in initial position, hypothesis II

Steps 2 and 5 of this model are almost identical to steps 1 and 4 postulated in the Rhotacism hypothesis, and need not be discussed here. We also assume that \**s* changes to [h] in all non-initial positions before step 3.

Step 3 is the main difference between the two hypotheses. The change s->4- is widely attested in Southern Chinese dialects (in particular Toisan, see Yue-Hashimoto 2004: 20-21; 169-175) and Central Tai (Li 1977). This hypothesis is possible regardless of whether \* $\theta$  is reconstructed as \*[4] or \*[ $\theta$ ]. In the first case, the two fricatives would never have merged, while i- the second would imply that \*l had already shifted to [ $\theta$ ] before step 3, because otherwise a merger would have occurred. At stage 3, pre-Arapaho would have had a system with two non-sibilant fricatives, namely \* $\theta$  and \*l, and only one sibilant fricative, namely \*f. There are no clear examples of the change [s] > [t] in a language that already has a phoneme / $\theta$ /. However, in the case of Toisan (and Central Tai) a labiodental fricative \*/f/ already existed in the system when \*s > l took place. Since [f] and [ $\theta$ ] are acoustically quite close, the Toisan development suggests that a change like step 3 in the scenario we propose for pre-Arapaho is not implausible.

**Step 4** is the merger of \**l* (but not \* $\theta$ ) and \**l* in \**l*. Such mergers are widely attested: in most Thai languages, proto-Thai \**lh* (phonetically \*[1] or \*[4]) merged with \**l* as *l*, though the original contrast was transphonologized, and survived as a tonal contrast.

The lambdacism hypothesis also accounts for the observed correspondence between proto-Algonquian \*r, \*s and \*l and Nawathinehena t-. We can posit the following steps for the development in Nawathinehena (Table 7). \*s and \*r first merge with \*l, becoming a lateral fricative, and the lateral fricative itself then changes to t, possibly via a stage \* $\theta$ .

PA	1	2	
*s	P* <	> t	
*r > *l	P* <	> t	
*θ		> t	
*t		> t	

*Table 7.* Development of some consonants in Nawathinehena

## 6. Conclusion

The two hypotheses presented here show how the rather exceptional correspondence between proto-Algonquian \**s*- and Arapaho *n*- can be explained in terms of sequences of plausible sound changes, and examples of their attestation in other languages have been provided in a panchronic perspective.

This article therefore shows that the development of proto-Algonquian \**s*- into Arapaho *n*- is not an unnatural sound change in itself:<sup>14</sup> each of the steps assumed in either of the two hypotheses is independently attested and phonetically motivated. The apparent strangeness of the correspondence results from the fact that it was brought about by an exceptionally high number of individual changes and mergers.

Thus, the rarity of the change of \*s to *n* in the world's languages is a consequence of the fact that no less than four steps are needed to derive it (\*s > \*z > \*r > n or \*s > \*4 > \*l > n), including two mergers (\*s and \*r, followed by \*r and \*n or \*4 and \*l, followed by \*l and \*n) in both hypotheses.

The hypotheses laid out in this work predict that should a diachronic correspondence of the type \*s > n ever be discovered in another language, the history of that language will include either the change \*r > n, or the change \*l > n, applying in the same contexts in which the \*s > n correspondence holds.

<sup>&</sup>lt;sup>14</sup> For a useful discussion on unnatural sound changes, see Blevins (2008).

### References

- Blevins, Juliette. 2008. Natural and unnatural sound patterns. In Klaas Willems & Ludovic De Cuypere, eds. *Naturalness and iconicity in language*. Amsterdam & Philadelphia: John Benjamins, 121–148.
- Bloomfield, Leonard. 1946. Algonquian. In Harry Hoijer & Cornelius Osgood, eds. Linguistic structures of native America. Viking Fund Publications in Anthropology, vol. 6. New York: Wenner-Gren Foundation, 85–129.
- Carter, Richard T., A. Wesley Jones, Robert L. Rankin, John E. Koontz & David S. Rood. 2006. Comparative Siouan Dictionary. Unpublished Database.
- Conathan, Lisa. 2006. Arapaho dictionary. http://linguistics.berkeley.edu/~arapaho/ arapaho\_english.html
- Costa, David J. 2003. *The Miami-Illinois language*. Lincoln: University of Nebraska Press.
- Cowell, Andrew & Moss, Alonzo Sr. 2006. *The Arapaho language*. Boulder: University Press of Colorado.
- Ferlus, Michel. 1982. Spirantisation des obstruantes médiales et formation du système consonantique du vietnamien. Cahiers de Linguistique – Asie Orientale 11: 83–106.
- Ferlus, Michel. 1998. Les systèmes de tons dans les langues viet-muong. *Diachronica* 15: 1–27.
- Goddard, Ives. 1974. An outline of the historical phonology of Arapaho and Atsina. *International Journal of American Linguistics* 40: 102–116.
- Goddard, Ives. 1979. Comparative Algonquian. In Lyle Campbell & Marianne Mithun, eds. *The languages of Native America*. Austin: University of Texas Press, 70–132.
- Goddard, Ives. 1988. Pre-Cheyenne \*y. In William Shipley, ed. *In Honor of Mary Haas: From the Haas Festival Conference on Native American Linguistics*, Berlin: Mouton de Gruyter, 345–360.
- Goddard, Ives. 1994. The west-to-east cline in Algonquian Dialectology. In William Cowan, ed. Actes du Vingt-Cinquième Congrès des Algonquinistes/papers of the twenty-fifth Algonquian conference. Ottawa: National Museums of Canada, 187–211.
- Goddard, Ives. 1995. Review of Picard 1994. *International Journal of American Linguistics* 61: 326–333.
- Goddard, Ives. 1998. Recovering Arapaho etymologies by reconstructing forwards. In Craig Melchert & Jay H. Jasanoff, eds. *Mir Curad: Studies in Honor of Calvert Watkins*. Innsbrucker Beiträge zur Sprachwissenschaft 92. Innsbruck: Institut für Sprachwissenschaft der Universität Innsbruck, 183–200.
- Goddard, Ives. 2001. The Algonquian languages of the Plains. In Raymond J. DeMallie, ed. *Handbook of North American Indians vol. 13 (Plains)*, Washington, D.C.: Smithsonian Institution, 71–77.

- Hewson, John. 1993. *A computer-generated dictionary of proto-Algonquian*. Ottawa: Canadian Museum of Civilization.
- Joüon, Paul & Muraoka, Takamitsu. 2006. *A grammar of Biblical Hebrew*. Rome: Editrice Pontifico Istituto Biblico.
- Kümmel, Martin J. 2007. Konsonantenwandel: Bausteine zu einer Typologie des Lautwandels und ihre Konsequenzen fur die vergleichende Rekonstruktion. Wiesbaden: Reichert Verlag.
- Kroeber, Alfred L. 1916. Arapaho dialects. University of California publications in American Archaeology and Ethnology 12: 71–138.
- Lass, Roger. 1994. Old English: A historical linguistic companion. Cambridge: Cambridge University Press.
- Li, Fang-Kuei. 1977. A handbook of comparative Tai. Honolulu: University of Hawaii Press.
- Michaud, Alexis. 2006. Three extreme cases of neutralisation: Nasality, retroflexion and lip-rounding in Naxi. *Cahiers de Linguistique – Asie Orientale* 35: 23–55.
- Pentland, David H. 1979. *Algonquian historical phonology*. Toronto: University of Toronto Ph.D. dissertation.
- Pentland, David H. 1997. Review of *Principles and methods in historical phonology: From Proto-Algonkian to Arapaho*, by Marc Picard, 1994. *Diachronica* 14: 383–386.
- Pentland, David H. 1998. Initial \*s > n in Arapaho-Atsina. *Diachronica* 15: 309–321.
- Picard, Marc. 1984. On the naturalness of Algonquian 4. *International Journal of American Linguistics* 50: 424–437.
- Picard, Marc. 1994a. On the evolution of PA \*s to Arapaho /n/. *International Jour*nal of American Linguistics 60: 295–299.
- Picard, Marc. 1994b. *Principles and methods in historical linguistics*. Montreal: McGill University Press.
- Salzmann, Zdenek. 1983. *Dictionary of contemporary Arapaho usage*. Wind River Reservation: Arapaho Language and Culture Instructional Materials Series 4.
- Yue-Hashimoto, Anne O. 2004. *The Dancun dialect of Taishan*. Hong Kong: City University of Hong Kong.

Author's address:

Centre de Recherches Linguistiques sur l'Asie Orientale (CRLAO) Institut national des langues et civilisations orientales 2 Rue de Lille 75007 Paris France rgyalrongskad@gmail.com

Authenticated | rgyalrongskad@gmail.com author's copy Download Date | 10/21/13 4:06 AM