The Navajo verbal complex: phonological and phonetic evidence -2

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Consilience: the convergence of evidence

"..literally a 'jumping together' of knowledge by the linking of facts and fact-based theory across disciplines to create a common ground of explanation.."

E.O Wilson, Consilience, 1998

Part 2 Speakers' knowledge of structure Evidence of structure in sound system

Navajo: Evidence for paradigmatic organization in the lexicon

- 1 Athabaskan verbal complex and W&P vs IP/IA templates -syntagmatic vs paradigmatic processes Definition of terms introduction to Navajo verbal complex idea of the core verb and paradigms in Navajo complex
- 2 Case study part 1: data + form analysis distribution facts sound profile
- 3 Case study part 2 continued morphosyntax
- 4 The Closed Lexicon

bíni'<u>séłtsih</u>

Disjunct				Co	njun L	Core	V	Stem erb]	
0 1b 1a 1c 1d 2 3	4	5	ба	6b	6c	78	9	Х	
	•					σ -	 + (3	-
					N	ODE.1s	VI	STEM.M	ODE

$\begin{array}{ccc} \sigma & \sigma \\ \begin{bmatrix} BASE \\ 7.8 \end{bmatrix}_{X} + \begin{bmatrix} BASE \\ 9.stem \\ MODE/1s \end{bmatrix}_{VCOMPLEX} \end{array}$



$\begin{array}{ccc} \sigma & \sigma \\ \left[\left[\begin{array}{c} BASE \end{array} \right]_{X} + \left[\begin{array}{c} BASE \end{array} \right]_{y} \right]_{VC^{OMPLEX}} \\ MODE/1s & VL.STEM.IPV \end{array}$

- the two bases represent two common types of inflection exponence and internal changes
- resulting = compound = LEXEME
 - COMBINED IN TO A VERBAL COMPLEX

InfIP 4 primary **MODE** conjugations

	I.	II PERFECTIVE				
PERSON	Ø	NI-	SI-	YI - Ø	SI	
sgl.					Ø – Ł	D - L
	(1)	(2)	(3)	(4)	,	
1.	yish	nish	shi	yiish	se	sis
2.	ni	ní	sí	sii	síní	síní
3.	yi	yi	_	yii	si	yis
30.	yi	yi	—	yiyii	yiz	-
3a.	ji	jí	_	jii	jiz	jis
3i.	' a	'í	_	'ii	′az	'as
3s.	ha	hó	_	hwo	haz	has

Base and Extended Paradigms Contain inflection for subject & obj Y&M 1987:200

$\begin{array}{c} \sigma & \sigma \\ \begin{bmatrix} BASE \\ MODE/1s \end{bmatrix}_{X} + \begin{bmatrix} BASE \\ WL.STEM.IPV \end{bmatrix}_{VCOMPLEX}$

morphosyntax

- interdependencies between the two lexemes
- between 'prefixes' to mode domain
- in disjunct and conjunct domains
 - and beyond

= VCOMPLEX

morphosyntax VCOMPLEX áhodidiniishtłóóh Navajo áhodidini – [ish] + [l.tłóoh]]_{VCOMPLEX} [øIPV.1] + ['cause to slaken']_{IPV}] I'm relaxed (nervous tension), I'm overcoming anxiety

áhodishchah áhodi – [ish] + [d.chah]]_{VCOMPLEX} reflexive [øIPV.1] + [d.'cry']_{IPV}] I'm pretending to cry

YMd:71

bidádi'nish'aah bidádi' – [nish] + [ø.'aah]]_{VCOMPLEX} YMd:172 *'blocking'* [*nIPV.1*] + [*handle* (*sro*)]_{*IPV}]* I close it with it, to block the entranceway or hole with it (a rock)</sub> Goal of lecture 2

Baseline description of the Athabaskan sound system
Provide a consilience of evidence for the structures
present in the language, including formatives,
Help recognize patterns
Serve as a ground for grammatical work

Speech is primary

the vehicle of communication fine grained phonetic detail community specific language is learned learners shape language

we can't depend on written forms to tell us about the structure of sound system features of contrast

Phonetic fieldwork

Acoustic and instrumental data document a language's sound system -segments, suprasegments, prosody, the features of contrast

Basis for evaluating grammatical analyses phonology, prosody, morphology, pragmatics, syntax..... all structure

most of the languages in the world are under-documented Break out of a dependence on ear-based transcription and orthographies, as a basis for grammatical analyses

Speech community is vital

Heritage, culture & repository of knowledge interchange of ideas, development of vocabulary, domains of speech in the community, function of language...

is in speech community

Qualitative and quantitative approaches to *phonetic data* play important roles

Produce *comprehensive documentation* and Develop *reliable and compelling analysis*

- Provide a potential for grounding investigation and discovery
- A means to move outside our perceptual, theoretical and linguistic biases

What constitutes a baseline description of sound system?

- Phonetic description of consonant and vowel inventories.
- Phonotactic, phonological and phonetic patterns in the lexicon
- Prosody





Dene Speech Atlas Seeds for the future

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The Navajo Sound System, McDonough 2003

'Gestural account of velar fricative in Navajo' JLP, 2012 Iskarous, McDonough & Whalen 'Athabaskan stops', JPhon McDonough & Wood, 2008 'Athabaskan Redux', 2001, McDonough 'Epenthesis in Navajo', 1999 McDonough

'How to Use Young and Morgan *The Navajo Language'* McDonough. 2016 <u>https://vimeo.com/176382467</u>

Athabaskan consonant phoneme inventory:

	bilabial	interdental	alveolar	alveolar	lateral	palato-	velar	labialized	glottal
				affricate		alveolar		velar	
stops and affricates	b	ddh	d	dz	dl	j	g		(
		tth	t	ts	tł	ch	k	kw	
ejectives		tth'	ť	ts'	tł	ch'	k'	kw'	
voiceless fricatives		th	S		ł	sh	x/h		h
voiced fricatives		dh	Z		1	zh	gh		
nasals	m		n						
glides , rhotics			r			y		w	

Vowel quality contrasts: 5 vowel system

 \cap

U

a

i

e

plus length, tone (H,L), nasality

Nouns, verbs, adjectives are closed class

minimal pairs ? construction of words for new items resistance to borrowing 'bricolage' lexicon – 'reusing' parts 'construction or creation from a diverse range of elements that are available'

The Athabaskan languages - Consonants

	lab	Inter dental	alv central	veolar lateral	Post-alveolar	Velar (uvular)	gl
stops	(p)		d	t ť		g k k' g ^w k ^w k ^w '	?
affricates		ddh tth tth'	dz ts ts'	dl tł tł'	jchch'	8 m m	
fricatives		dh th	S Z	łl	zh sh	x gh x ^w gh ^w	h
nasals	(m)		n				
		r			(y)	(w)	

The Athabaskan languages - Consonants

	lab	Inter dental	alve central	eolar lateral	Post-alveolar	Velar (uvular)	gl
stops	(p)		d t	t ^h t'		g k ^h k'	?
affricates		dð tθ ^h tθ'	dz ts ^h ts'	dl tł ^h tł'	dʒ tʃʰ tʃ'	<u>д к к</u>	
fricatives		θð	S Z	łl	3 ∫	x y x ^w y ^w	h
nasals	(m)		n				
					(j)	(w)	

3 way series in stops and affricates: *voiced voiceless ejective* d t t' dz ts ts'

Stops are (represented as) voiced d, dz, j, dl, g

Lots of obstruents 'largest obstruent inventory' Ladefoged and Maddieson

Mostly coronal contrast labials are rare few velars - uvulars place of articulation not robust contrast

Fricative voicing is contextual (s, sh, i, x, χ)

Dene Sųłiné Orthography

	Labial	Inter- dental	Alveolar		Post- alveolar	Velar (uvular)	Glottal
			Central	Lateral			
stops	(b)		d t ť			g k k' gw kw kw'	í
affricates							
		ddh tth tth'	dz ts ts'	dl tł tł'	j ch ch'		
fricatives						X XW	h
		th dh	S Z	łl	sh zh	gh ghw	
rhotic			r				
nasals	m		n				
approx					У	W	

North Slavey contemporary orthography

	bilabial	interdental	alveolar	alveolar affricate	lateral	palate- alveolar	palatal	velar	labialized velar	glottal
stop and affricates	b	ddh	d	dz	dl	j		g	gw	,
	р	tth	t	ts	tl	ch		k	kw	
ejectives	p'	tth'	ť	ts'	ťľ	ch'		k'	kw'	
voiced fricatives	V	dh		Z	ł	zh		gh	ghw	
voiceless fricatives	f	th		S	Ι	sh		Х		h
nasals	m		n							
nasalized stop	mb		nd							
resonants			r				у		W	
glottalized resonant							-		W'	

A contemporary orthography of the South Slavey Standardization Committee as reported in the *Dictionary of the Verbs of South Slavey* (second edition, 2004)

Consonant Sounds

	labial	inter-	alve	olar	post-	velar or	glottal
		dental				back	
			central	lateral			
stops	bpp'		d t ť			gkĶ	2
affricates		ddh tth tth'	dz ts ts'	dl tł tł	j ch ch'		
fricatives		dh th	s z	1	<u>sh</u> zh	x gh	
rhotic			(r)				
nasals	m		n				
	mb		nd				
approximants					(y)	w	

The sounds /m/ and /mb/ and /n/ and /nd/ may be alternants of each other.

A contemporary Tlį Chǫ (Dogrib) orthography.

	bilabial	alveolar	alveolar affricate	lateral	palate- alveolar	palatal	velar	labialized velar	glottal
stop and affricates	b	d t	dz ts	dl tl	j ch		g k	kw	,
ejectives		ť	ts'	ť'	ch'		k'		
voiced fricatives			Z	ł	zh		gh	ghw	
voiceless fricatives	m	n	S	I	sh		x h		h
pre-nasalized stop	mb	nd							
resonants		r				У		W	

The Navajo inventory of sounds

Table 1 Navajo consonants in the orthography of Young and Morgan 1987.



Athabaskan sound system

- Phoneme inventory and phonotactics
- Phonological processes consonant harmony 'd-effects and stem initial alternations
- Stops series voicing aspiration and affrication status of stems

McDonough, 2003, *The Navajo Sound System The Dene Speech Atlas, online*

Phonotactics

Stems are special -closed class Final syllable in the VComplex 500 ROOTS (mainly) monosyllabic CV(V)(C)

stem alternation patterns = 'stem sets' marked for mode **Phonotactics** 500 ROOTS - monosyllabic **CVVC TSOOS** wrinkle TŁ'IIH something sticky CHA cry a globular object BĄĄS drink DLĄ shake DZID Ϋ́Α΄ handle (SRO)

Phonotactics

Stems are marked for mode 'ААН learn

ø.'aah (I) ø.'ááh (R) o.'áá́' (P) ø.'ááł (F) ø.'ááł (O) bíhoo'aah_{ipv} it was learned

stem alternation patterns are not understood

STEM SETS = VERB BASES

TLÁAD stop or halt 345

ASP	VL	IMP	REP	PRF	FUT	0
МОМ	1	<u>tłáád</u>	<u>thi</u> '	<u>tłah</u>	tłił	tłáád
МОМ	ł	<u>tłáád</u>	<u>tłi</u> '	<u>tłah</u>	tłił	<u>tłáád</u>

TŁÍÍSH- to move independently through the air 346

MOM	ø	<u>tłíísh</u>	tłish	<u>tłizh</u>	<u>tłish</u>	<u>tłíísh</u>
CON	ø	<u>tłiish</u>	tłish	<u>tłizh</u>	<u>tłish</u>	<u>tłiish</u>
REP	ł	<u>tłish</u>	<u>tłish</u>	<u>tłish</u>	<u>tłish</u>	<u>tłish</u>

(no frequency values for these verbs from corpora)
Navajo consonantal contrasts – in **stem onsets**

 $(k^{w} g^{w})$? ' k g ts' t**f' tf' tf' ch'** k' ť **x** *h, x, w* y^w *w* sh h S ſ y gh 3 zh Ζ 4 *ł* 1 **(m)** n (w) (j) y

Navajo consonantal contrasts – in **stem onsets**

 $(k^{w} g^{w})$? ' k g ts' t**f' tf' tf' ch'** k' ť **x** *h, x, w* y^w *w* sh h S ſ y gh 3 zh Ζ 4 *ł* 1 **(m)** n (w) (j) y

	Na	vajo co	nsonan	tal cont	rasts	- non-ste	ems	
	C	d s	sh	n	h	~	·ł	
(p)	t <i>d</i> tx <i>t</i> t'	ts dz ts ^h ts ts'	tł dl tł ^h tł tł' tł'	t∫ j t∫ ^h ch t∫' ch'		k g kx k k'	(k ^w g ^w)	?'
	S Z			∫ sh 3 zh		х h, x, w ү gh	y ^w W	h
		(ɬ) ł (l)						
(m)	n							
(w)					(j)			

McDonough & Wood, 2003

Vowel quality contrasts: Navajo stems

e o a

I

plus length, tone (H,L), nasality = 16 vowel contrasts



plus length, tone (H,L), nasality = 16 vowel contrasts

Onsets of stems are the single place where the full set of consonantal contrasts occur.

áhodidiniishtłóóh áhodidini – [ish] + [I.tłóóh]]_{VCOMPLEX} [øIPV.1] + ['cause to slaken']_{IPV}] I'm relaxed (nervous tension), I'm overcoming anxiety

Otherwise: place, most manner and laryngeal features are neutralized vowel contrasts are almost completely neutralized

Highly constrained system.

do stems or stem-like formatives occur anywhere else?

yes.

Modeling the verb:

stems

a. stems neheshk'ééh

I slice it (as bread) 'ahééníshtl'ééh *I jogged around in a circle* diniiishjih I grabbed it and hung on

b. stems bits'ánístsóós I took it from them bik'ehdishdleeh I overcame him bits'ánéiit'aash

we left him

Phonological processes

- Consonant Harmony
- Stem initial mutations, 'd-effects' status of 'classifier' morphs

Consonant harmony within the core verb



Affects coronal fricatives and affricates

yish cha jɪʃ tʃɑh [+ant]
yis tsoos jɪs tsoos [-ant]
yish øipv.1

Consonant harmony within the core verb

Core verb domain of Consonant Harmony (17) dzizdiz ~ jizdiz 'she spun it' (YMg77) (optional) optional within the conjunct but *outside the core verb*

(18) ch'ínís ts'óód +ant [-ant -ant] $ch'í \# [nish] [\emptyset ts'óód]$ 'out' # [nIPV.1st] ['cl' 'stretch'] D # [AM] [Verb] 'I lean out' (YM:d294) Not occurring in disjunct

Stem initial mutations 'd-effects'

Trigger: adjacency of consonantal segments 'classifiers' = valence marker (reduced productivity) ø, ł, d, l (d+ł) C.stem → c.cvvc

Stem initial mutations 'd-effects'

Trigger: adjacency of consonantal segments 'classifiers' = valence marker (reduced productivity) \emptyset , i d I (d+i) C.stem \rightarrow c.cvvc

Consonants in coda of Mode yi<u>sh</u>ø.<u>chah</u>

biggest affects are on fricatives

Incorporating onsets the 'd-effects' cl.stem 4 'classifiers' [ø, ł d, l] +stem

classifier-stem	ø.stem	'd'.stem	<i>YM 1987</i>
(ø-) / (d-loh)	sé <u>loh</u>	yisdloh	
	I lassoed it	it was lassoed	
(ø-) / (d-nil)	baa ní <u>nil</u>	nánísh <u>'nil</u>	122
	I gave them to him	I brought them back to	
		him	
(ø-) / (d-'á)	baa ní <u>'</u> ą́	bigha nish <u>t</u> 'á I took it	126
	I brought it	away (SRO)	
(ø-) / (d-yį́)	ní <u>yí</u>	yí <u>gí</u>	126
	I arrived hauling it	it was hauled to him (LPB)	
(ø-) / (d-ziid)	yiih yiyíí <u>ziid</u>	biih yi <u>dziid</u>	125
	he poured it into it	it ws poured into it	

d.stem \rightarrow C.CV(V)C \rightarrow CCV(V)C

Stem domain:
 classifier(vl).stem
 @- / d.loh → loh / dloh
 @- / d.nil → nil / 'nil
 @- / d.'ą → 'ą / t'ą
 @- / d.ziid → ziid / dziid

introduces a 'period of interruptedness' =
 coronal stop closure
 stops and fricatives → affricates

d.stem \rightarrow C.CV(V)C \rightarrow CCV(V)C

Stem domain: introduces a 'period of interruptedness' = coronal stop closure conditioned by phonemic structure:

stops and fricatives \rightarrow affricates nasals \rightarrow preglottalized glottal stop \rightarrow coronal ejective t' affricates, plain stops are unaffected

Idteral classifier I and I (a) yishch'al_{imp} [yish]_{øimp} [ł.ch'al]_{imp} [øimp.1]øimp [cl.'lap up']imp 'I lap it up' (b) yílch'al_{perf}

(b) yíłch'al_{perf} [yĺ] perf [ł.ch'al]_{pfv} [øpfv.1] [cl.'lap up']pfv 'I lapped it up'

Y&M1987:d779

Y&M1987:d779

the classifiers will incorporate into an available position if it can't be incorporated into onset (b)

- the d-classifier never surfaces
- the lateral classifiers delete before coronal fricatives
 - but keep coronal fricatives voiceless

(13) yiissįįh_{impf} YM1987:d796
[yiish]_{ipv} [ø.sįįh]_{lpv}
[1st Su]ipv ['stand']ipv
"I stand"



Root = Z*įį́H* 'stand' siįh zį́ stem sets 'stand'

Fricatives vary for voicing according to context voiceless after voiceless segments voiced between vowels

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(37) s\acute{e}soil_{perf} Y&M 1987:d798
[ sé ]<sub>s</sub>PFV [ i.soil ] PFV
[ sPFV.1 ] [ cl.'blow, cause wind' ]PFV
'he blew on it'
```

 $[1.sol] PFV \rightarrow [sol] PFV$

As Sapir-Hoijer (1967), Hale (1972), Hale and Honie (1972), Kari (1976), Young and Morgan (1980, 1987) and others have noted, the voiceless classifier ł deletes before *all* coronal fricatives, including laterals.

Phonological processes

 $\sqrt{\text{Consonant Harmony}}$

- regressive from stem
- domain : core verb

√ Stem initial mutations, 'd-effects' status of 'classifier' morphs incorporated into stem onset but interacts within core verb

Phoneme inventory

a phonetic documentation of the sound contrasts

Dene Inventory

Navajo (Young and Morgan 1987)

	lab	alveolar		Post-alveolar	Velar	•
		central	lateral			
stops	(p)	dtť			g k k′	(
					g* k*	
affricates		dz ts ts'	dl tł ^h tł⁄	j ch ch'		
fricatives		s z	¥ 1	sh zh	x	h
nasals	m	n				
approx				у	w	

Dene Inventory

Dene Sųłiné (after Li, 1946) (Orthography)



Dene Inventory

Tsilhqut'in (after Cook, 1989, 1993)



¹Cook (1993) and others have noted that there are two series of alveolar consonants in Tsilhqut'in, one series causes vowel flattening and the other vowel sharpening.

Dene Inventory Obstruent series

	labial		alveolar	<u>alveo</u> - palatal	velar	<u>labio</u> - velar	glottal
plosives affricates	b	<u>ddh tth</u> tth'	d t <u>ť</u> <u>dz ts ts′</u>	j <u>ch</u> ch'	g k <u>k</u> '	<u>gw</u> kw	,
lateral			dl <u>tł</u> tł				
fricatives		dh <u>th</u>	s z	<u>sh</u> zh	<u>gh</u> x		h
lateral			ł 1				

Dene Inventory Obstruent series



Dene Inventory Obstruent series

	labial		alveolar	<u>alveo</u> - palatal	velar	<u>labio</u> - velar	glottal
plosives	b		d t <u>ť</u>		g k <u>k</u> ′	<u>gw</u> kw	,
affricates		<u>ddh tth</u>	<u>dz ts ts'</u>	j <u>ch</u> <u>ch</u> '			
		<u>tth</u> ′					
lateral			dl <u>tł</u> tł′			\backslash	
fricatives		dh <u>th</u>	s z	<u>sh</u> zh	gh x		h
lateral			ł 1				

McDonough, 1990, 2003 Iskarous, McDonough and Whalen, 2012

3 way stop series voiced/voiceless - aspirated - ejective

common phonological pattern

3 way stop series 24% UPSID database Patterns of Sounds, Maddison, 1984

d t t^h

voiced voiceless aspirated (25%) classic VOT contrast

t t^h t'

voiceless aspirated ejective (15%)

3 way stop series 24% UPSID database Patterns of Sounds, Maddison, 1984

d t t^h

voiced voiceless aspirated (25%) classic VOT contrast

t t^h t' Dene Pattern? voiceless aspirated ejective (15%)

this pattern makes sense phonologically but not phonetically

d = /t//d/ g = /g//k/t = $/t^{h}/$ k = $/k^{h}/$

Why this asymmetry?

Evidence for affricate analysis-VOT

VOT is a well-documented, robust oral-laryngeal timing contrast (Lisker and Abramson, 1864; Cho and Ladefoged, 1999)

VOT = voicing onset time = release of burst to onset of voicing

basis of *many* categorical perception studies

VOT contrast = 3-way laryngeal contrast in the timing of the oral gesture (release) to the laryngeal gesture (voicing onset)

Measured from oral release burst to onset of vowel voicing



+ VOT = 'aspirated stop'

Evidence for affricate analysis-VOT

VOT : 3-way contrast timing of release of stop to onset of voicing Lisker and Abramson, 1964


Evidence for affricate analysis- VOT

VOT is a well-documented oral-laryngeal timing contrast (Lisker and Abramson, 1964; Cho and Ladefoged, 1999)

Dene stop contrasts = temporal profile

(McDonough, 2003; McDonough & Wood, 2008)





Navajo: 'biteel' [pɪtx^je:l]



Northern Dene

Southern Dene

VOT as part of the transition to the vowel





reasons to reconsider this pattern t \rightarrow t^h

Phonetics contrast is not a VOT contrast

Morphology the contrast is morphologically conditioned







/t/ phoneme in 5 Dene languages



not an aspirated stop





Dogrib (NWT), 2010

Evidence for affricate analysis of plain stops *t* and *k* 'aspirated' stops

 \sqrt{VOT} is a well-understand contrast $\sqrt{Unaspirated stops} = voiced or unaspirated$ $<math>\sqrt{Sound}$ and look like affricates

g = /g / /k /d = /t / /d / $t = /t^{h}/$ $k = /k^{h}/$ ↓ /tx/

/kx/



is this just a phonetic realization of a phonologically valid contrast?

d = /t//d/ g = /g//k/t = /tx/ k = /kx/

Dene Inventory Obstruent series

Simplex stops	р	t		k		?
		tx		<u>kx</u>	kw	
affricates		ts tsh	tí th			
		ti tin				
ejectives		ť		k'		
		<u>ts'</u> tł'	ţſ			
fricatives		s z	∫z	у х		(h)
-		4	-	-		. ,

Evidence for affricate analysis

√ Sound and look like affricates
 Described as affricates
 VOT is a well-understand contrast
 Unaspirated stops = voiced or unaspirated
 Aspiration in affricates

Evidence for affricate analysis- Descriptions

"...t and k are unvoiced fortes and are always followed by a heavy spirantal aspiration similar to the [velar] consonant x." (Hoijer (Jicarilla) 1946:58).

"...the pulmonic velar stops are essentially affricates, i.e., [kx] and [gr] (Holton (Tanacross) 2001:29).

"/t/ is a strongly aspirated phoneme produced by placing the tip of the tongue in a t position, followed by raising the back of the tongue to a point of near contact with the velum..." (Young and Morgan 1987:xv).

Evidence for affricate analysis- Descriptions

Carrier (Dakelh)): Morice, 1932 Chiracahua Apache: Hoijer, 1938, 1946 **Jicarilla Apache**: Tuttle and Sandoval, 2002 **Navajo**: Sapir and Hoijer, 1967; Young and Morgan, 1980, 1987; McDonough and Ladefoged, 1993; McDonough, 2003 Slave dialects: Rice, 1989 Tanacross (Alaskan): Holton, 2001 Chipewyan (Dene Syline): Goddard, 1912; Li, 1933, 1946; Haas, 1968

Evidence for affricate analysis- Descriptions

Hoijer 'Chiracahua Apache' (1946 p55-84) t = /tx/

táí	/txáí/	three
shitéézh	/shitxezh/	two beings lie
hasti	/hastxi/	oldman
to	/txoh/	water
kaa	/kxaa/	disease

Hoijer 'Chiracahua Apache' (1946 p58)

...the b,d,g are 'voiceless unaspirated surds' [p, t, k]

...and the g is fronted before front and backed before low and round vowels.

 $[k] \rightarrow ci \chi a$ wo

Evidence for affricate analysis

- $\sqrt{\text{Sound}}$ and look like affricates $\sqrt{\text{Described}}$ as affricates
- is this a valid phonological pattern?



McDonough and Wood, 2008



McDonough and Tucker, 2012

Dene Sųline : voiced closures



North Slavey- voiceless closures





Figure 10 Spectrograms demonstrating the nasal n, stop t ([tx]), and fricative z in stem initial position in the words binii', biteel, bizid.







Dene Inventory Obstruent series

р	t		k		?
	tx		kx	kw	
	ts tsh	tí th			
	tt tth				
	ť	10	K		
		Ţ			
	S 7	[7	v x		(h)
	4 1	, -			(1)
	p	p t <u>tx</u> <u>ts tsh</u> <u>ti tih</u> <u>t'</u> <u>ts' ti'</u> <u>s z</u> <u>i</u>	p t <u>tx</u> <u>ts tsh</u> tf tfh <u>ti tih</u> <u>t'</u> <u>ts' ti'</u> <u>s z </u>	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	$\begin{array}{cccccccccccccccccccccccccccccccccccc$

Laver, 1991, McDonough and Wood, 2008

Evidence for affricate analysis of plain stops

 √ Sound and look like affricates
 √ Described as affricates
 √ VOT is a well-understand contrast data doesn't fit the phonetic patterns

'unaspirated' stops = voiced or unaspirated 'aspirated' stops = affricates *tx* and *kx*

cf. Aspiration contrast in affricate series

What does reanalysis illuminate?

- stem onsets
- **d-effects closure + fricative in onset** (McDonough, 1990, 2001)
- $t \rightarrow k$ alternation (Hoijer, 1945; Haas, 1968)
- **ejectives** (Hogan, 1976; Lindau, 1984; McDonough, 2003; McDonough & Wood, 2008)
- Tsilqut'in pharyngealization (Cooke, 1993; Hansson, 2000)

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What does reanalysis illuminate?

 $t \rightarrow k$ alternation = $tx \rightarrow kx$

	Navajo	Jicarilla Apache
father	ta' /txa?/	kaa' /kxaːʔ/
lie down	tį /txį́/	kį̇́ /kxį̇́/
shore	tábąąh /txápąąh/	kasbąą /kxasbąą/
sixty	hastádin /hastxádin/	gokádin /gokxádin/
water	to' /txo/	ko' /kxo/
sew	ná'áshkad /ná?áshkad/	ná'ishkad /ná?ishkad/

Hoijer 1945; Hass, 1968 Data: Young and Morgan, 1987; Phone at al, 2008

Tsilhquit'in (Chilcotin) **pharyngealization** 'inventory gaps'

Tsilhquit'in inventory

- series of velar & uvular fricatives and stops
 k 'k^h' k', q 'q^h' q' х ү, х в
- no uvular affricate series (*qχ)
- two series of alveolar affricates
 ts, ts^h ts', ts^ς ts^{ς^h} ts^{ζⁱ}

'Flattening': (Cook, 1983, 1993; Krauss, 1975; Hansson, 2000)

- pharyngealized alveolar affricates
- with the pharyngeal stops and fricatives,
- cause a 'flattening' effect on following vowel
Ejectives

Dene Ejectives

- striking temporal profile, characteristic of family
- maintain a long release period
 - longish period between
 - release of the oral gesture and
 - release of glottal gesture

'Strong ejectives' vs 'weak' ejectives

Dene Sųline, Cold Lake, Alberta hahot'į [hahot'i] 'he was married'



'strong' ejective w 'period of silence' (Hogan 1976; Lindau, 1984)

Dogrib, Rae, NWT

sech'a [sɛt∫'a] 'against me'



'strong' ejective w 'period of silence' (Hogan 1976; Lindau, 1984)

Complex ejective: det'ath [det'a0] 'he's cutting it (with a blade) again'



'strong' ejective w 'period of silence' (Hogan 1976; Lindau, 1984)



Simplex ejective: dethułt'us [deθułt'us] 'it's stuck on'



'weak' ejective (Wright et al, 2002; Byrd, 2002) weak ejectives tend to be heard as unaspirated stops /d/

Ejectives

Dene Ejectives

'Strong ejectives' vs 'weak' ejectives temporal contrast in the profile of the ejective

mishearing t' → d Wright, Hargus and Davis, 2002; Bryrd, 2002) causes a categorical shift from

different from 'stiff' and 'slack' ejectives laryngeal contrast (Kingston, 1990; Wright, Hargus and Davis, 2002)



Figure 26 Spectrogram illustrating short VOT with flat f0: speaker RG.



Temporal analysis of stop series complex segments share

Strong temporal profile for complex segments closure-to-release

since closures are primarily *t* the contrasts are realized in the *release portion the fricative portion*

duration of release period is maintained as an critical cue



Temporal analysis of stop series complex segments share

Strong temporal profile for complex segments closure-to-release

Weak ejectives are interpreted as simplex /d/ Witsuwit'in Wright, Hargus & Davis (2002) Dakelh (Carrier) Byrd (2002)

Similar patterns

Kabardian (Gordon and Applebaum, 2006) Tlingit (Maddieson, Smith and Bessell, 2001).

Evidence for affricate analysis of *t* and *k*

- share the profile of 'regular' affricates
- the release periods velar constriction
- across the language family (see the *Dene Speech Altas*)

complex segments in stem onsets

Findings of phonetic studies: Navajo and Northern Dene

- Break in word between the two last syllables (core verb)
 - equivalent to a *boundary* in the word
- Robustness of verb and noun stems forms
 - distribution of phonemes (consonant and vowel contrasts)
 - concomitant reduction of contrasts outside stems
 - length of stems
- resulting distinct phonetic, thus phonological and phonotactic properties
- point of change-outs
- stability of fine grained detail across the family (McDonough and Wood, 2008)
 - reanalysis of phonemic structure
- tone systems

STEMS are closed class

rigidly monosyllabic

- incorporation of codas = tonogenesis (Krauss 2006; Leer 1999; Kingston 2006)
- incorporation of ∨L affix = 'd-effects' and 'classifier' alternations (Hoijer 1967; Bennet 1985; McDonough 1999)

very prominent

phonotactic and phonetic (McDonough, 1990, 1999, 2003)



Figure 14 Characteristic spectrograms of *yishcha* (top), versus *ch'inini/chxeeh*: one speaker. Note the differences in the release period of the stem's onset *ch* [t].

McDonough, 2003



Duration of vowels in stems and non-stems

Vowels



$[CVC] + [CVC]_{WD}$ [(af)-BASE] + [af-BASE]_{WD}

verbal compound

Dene verb is a compound of two LEXEMES

$\begin{bmatrix} \dots \begin{bmatrix} \mathsf{BASE} \end{bmatrix}_X + \begin{bmatrix} \mathsf{BASE} \end{bmatrix}_y \end{bmatrix}_{\mathsf{WD}}$ $\sigma \qquad \sigma$

- the **rightmost** element (VL + STEM) is a **LEXEME**
 - STEM SETS inflected for mode, suppletion
 - special status
- left element is MODE LEXEME
 - inflected is a MODE person and number,
 - organized into InflP through exponence
- Two lexemes are compounded
 - to produce an inflected word level LEXEME
 - organized into its own inflectional classes

ch'íhi'<u>niilchééh</u>

run out (horizontally), to come into view running (2 actors)

ch'íhi'- niiIchééh[af $[BASE]_x + [BASE]_y]_w$ σ σ suppletion

Core (minimal) verb

$\begin{bmatrix} \text{Core VERB} \\ [\dots [\text{NIPFV.1S}]_{IPFV} + [\text{VL.STEM}]_{IPFV} \end{bmatrix}_{IPFV} \end{bmatrix}_{IPFV}$

Core verb = minimal verb

- two syllables = two distinct domains
- extended base in left domain
- Final syllable is VERB BASE VALENCE -STEM
- VL.STEM is a LEXEME inflected for aspect and marked for valence (derivational, resulting in STEM SETS)
- **STEM SETS** are word families
- Penult syllable is LEXEME = BASEPARADIGM
- mode conjugation (4 primary conjugations)
- MODE inflected for person and number = word tokens- inflected forms of a LEXEME

Core verb

- disyllabic
- minimal morphosyntactic specification in a
- well formed word.

Words reside in dense neighborhoods of related forms

áhodidi<u>niishtłóóh</u>

relax (nervous tension), overcome anxiety

áhodi<u>yiilkah</u>

dilly-dallying along with them (3 or more subjects).

bidádi<u>nish'aah</u>

close it with it, block the entranceway or hole with it (a rock)

ch'íhi'<u>niilchééh</u>

run out (horizontally), to come into view running (2 actors)

Task:

- Identify the constituent elements in the verbal complex
- Their arrangements
- Combinatorial operations
- Identify the patterns in the lexicon

Principle 1. Identifiability of constituent forms

learners will reorganize and make use of more transparent and emergent forms.

Speaker simplification of sound forms is a force in language change and variation.

Word formation is built on learnability.

Model of the Dene verb

Navajo verb: 'ahodishcha

[af - TAM + af - LEX]^{YM:d71} [**'ahod - ish + d - cha**] 'pretend' - ØIMP.1s VL - 'cry'.IMPV

'ahodish + cha 'I pretend to cry'

reflexive + area = 'fake, pretend, feign' continuative imperfective

Navajo : ['ahodish + X]

af – TAM + af - LEX **'ahod – ish + x** *'pretend' – øIMP.1s*

> 'ahodishwosh 'I pretend to sleep, feign
> 'ahodish'i 'I lie, fake' (make a pretend)
> 'ahodiyiilkah 'we dilly-dallied' (pretend to walk, 3+ actors)

ch'ininishkaadaf – TAMaf - LEXch'i – ni – nish+ł – kaad'horizontal' - TERM – NIMP.1SVAI - 'herd'.IMPV

ch'ininish + łkaad 'I herd them out' I cause them to move out along a horizontal surface YM:d290

bits'a'níshkǫ́ǫ́h swim away from it

bits'a'nísh'eeł sail away from it

bits'a'níshdlǫǫsh move away 'on all fours'

bits'a'níshbáás drive away from it
Young and Morgan 1987:d256

bits'a'níshbáás drive away from it

Young and Morgan 1987:d256

bits'a'níshkǫ́ǫ́h swim away from it

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bits'a'níshdlǫǫsh move away 'on all fours'

bits'a'níshbáás drive away from it

'iisdziis pull or drag O out of sight

'adaas 'iisdziis pull down from a height

'ałts'ásdzįįį́s pull apart

bíis 'iisdziíís pull and add to a pile

bikiisdziįį́s cover O

'adah ch'ésdziís drag O over the edge

haasdziis pull O out (like a splinter)

Young w/ Midgette 1992:174

Verb : DZíį́S 'pull' InflCl

'iisdzijs pull or drag O out of sight 'adaas 'iisdzijs pull down from a height 'ałts'ásdzijs pull apart bíis 'iisdziis pull and add to a pile bikiisdzijs cover O 'adah ch'e dziis drag O over the edge haasdzijs pull O out (like a splinter)

morphosyntactic functions

haidzíís he's pulling it up out haadzíís it's being pulled up out ha' adídzíís he' s pulling himself .. ha' ahidzíís they' re pulling each other... hayídzíís he pulled it.. ha' ádoodzíís he pulled himself..

ch' ínísdzíís I tow it out...

Dene verb is a **compound** of two BASES The two bases are LEXEMES The fully inflected word is a LEXEME

$$\begin{bmatrix} \dots \begin{bmatrix} \mathsf{BASE} \end{bmatrix}_X + \begin{bmatrix} \mathsf{BASE} \end{bmatrix}_y \end{bmatrix}_{\mathsf{WD}}$$

$$\sigma \qquad \sigma$$

Inflectional class is determined by word form

Polysynthetic lexicon is paradigmatic.

Position class template for Navajo verb Hoijer 1967; Young and Morgan 1987)

KEY (from left to right):

0	Direct object of postposition. Possessive prefix with nouns.	
Ia	Null postposition	
Ib	Adverbial – Thematic ('postpositional stems')	
Ic	(Reflexive)	Disjunct
Id	(Reversionary)	I the lexicon
le	aolysynthesis	
II	(Herative) in Ioono	
III	(Distributive Plural)	
	data	
IV	Birge Chriect Pronouns	
V	Deictic Subject Pronouns	
VIa	Adverbial – Thematic	
VIb	Adverbial – Thematic	
VIc	Transitional / Semelfactive Aspect markers	Conjunct
VII	Modal - Aspectival Conjugation markers	
VIII	Subject Pronouns	
IX	'Classifier'	

Х	Stem	Stem

Two inflected **LEXEMES**

morphosyntax VCOMPLEX Phonetic study provides evidence for the identification of constituent elements within the verbal complex

Status of stems

robust elements distinct phonotactic and phonetic profile simplex and complex onsets may appear in different positions in the word

how does this work?

STEMS are closed class

rigidly monosyllabic

- incorporation of codas = tonogenesis (Krauss 2006; Leer 1999; Kingston 2006)
- incorporation of VL affix = 'd-effects' and 'classifier' alternations (Hoijer 1967; Bennet 1985; McDonough 1999)

very prominent

phonotactic and phonetic (McDonough, 1990, 1999, 2003)

Phonetic study provides evidence for the identification of constituent elements within the verbal complex

phonemic inventory is not well captured by conventional contrast sets.

the complexity of obstruent set severally constraint onset of stems complex stems are longer longer consonants and vowels 'content' Phonetic study provides evidence for the identification of constituent elements within the verbal complex

Status of pre-stem reduced contrast sets inflectional behavior carrying rich sets of morphosyntactic/sematic info combines with stem into core verb classic paradigmatic info Findings of phonetic studies: Navajo and Northern Dene

- Break in word between the two last syllables (core verb)
 - equivalent to a *boundary* in the word
- Robustness of verb and noun stems
 - distribution of phonemes (consonant and vowel contrasts)
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 - length of stems
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- point of paradigmatic variation and inflectional classes
- stability of fine grained detail across the family (McDonough and Wood, 2008)
 - reanalysis of phonemic structure
- tone systems



bits'aníshť á áh

Words (not morphemes) are fundamental objects of analysis, even in highly complex verbal systems.

This approach is "**paradigmatic**, because it identifies (sets of) patterns that whole words participate in, and **configurative**, because, while the meaning of a word form is not necessarily construed as a straightforward composition of individually meaningful parts, the meaning of the whole is associated with **reliable arrangements of its constitutive elements**."

Ackerman and Malouf 2013

Part 3 Modeling the verbal complex part 1





Dene Speech Atlas Seeds for the future

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