On the origins of multiple exponence in Crow

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1 Data

- Crow exhibits multiple exponence (ME) in which morphemes that encode the same information are realized multiple times:

(1) **baa**-lisshí-k
1A-dance-DECL
'I danced'   [Cyle Old Elk; Cyle_072018_005.wav]

(2) **baa**-xalússhi-**w**-ii-k
1A-run-**1A**-FUT-DECL
'I will run'   [Felice Big Day; 2018-17.084.004:46]

- Other Siouan languages also exhibit ME, such as in dative and benefactive constructions:

(3) Lakota w/ *y*-initial stems
o-**wa**-ki-(**bl**-)yakA
STM-**1A**-DAT1-(**1A**-)tell
'I tell to'
(Ingham 2003:24)

(4) Hoocąk w/ 2nd person šV
ho-**ra**-gí-**ša**-rak
PV-**2A**-APPL.BEN-**2A**-tell
'you tell s.o. something'
(Helmbrecht and Lehmann 2008)

(5) Osage
wá-**ða**-ki-š-pą
3B.PL-**2A**-DAT-**2A**-invite
'did you invite them?'
(Quintero 1997:273, Ex.270)

(6) Omaha
iⁿ-**thé-shp**axu
1B.BEN-**2A**.BEN-**2A**.write
'you write it to me'
(Marsault 2019, Ex.5b)

- ME may arise through coalescence of periphrastic constructions, such as benefactives from 'give'. In such cases, idiosyncratic inflectional patterns may become trapped.

(7) Paradigm I:
  a. **dii**-wah-chiwaká-a-**wa-ku**-k
     2B-1A-pray-JUNCT-**1A-BEN**-DECL
     'I prayed for you'   (Felice Big Day; FBD_022619)
  b. baapáalikisshe-m **dii-wa-kú**-k
     flower-INDEF   **2B-1A-give**-DECL
     'I gave you a flower'   (Felice Big Day; FBD_022619)

(8) Paradigm II:
  a. bah-chiwaká-a-**wa-la-ku**-k
     1A-pray-JUNCT-**1A-2A-BEN**-DECL
     'I prayed for you'   (Felice Big Day; FBD_022619)
  b. baapáalikisshe-m **ba-lá-ku**-k
     flower-INDEF   **1A-2A-give**-DECL
     'I gave you a flower'   (Felice Big Day; FBD_022619)

- Most Siouan languages express benefactives through prefixes, but in Hidatsa and Mandan, the benefactive construction is expressed periphrastically with 'give' occurring after the main verb.

(9) Hidatsa
mada-macidóò-hgee óbcaai-Ø   **m-gú$^{\textrm{?}}$-Ø**
1POS-awl-DIMUN   stick.in-JUNCT **1B-give-IMP.SG**
'Thread the needle for me!'   (Park 2012:543, Ex.116)

(10) Mandan
ą́awe rusháa **ma-kú'-ta**
all   take   **1B-give-IMP.MASC**
'take all of it for me'   (Hollow 1973:78, cited in Kasak 2019)

- Crow and Hidatsa may express future via inflectional suffixes *-ii* and *-hi*:

(11) Crow   (12) Hidatsa
baa-xalússhi-**w-ii**-k   **maa**-háhgu-**wi**-c
1A-run-**1A-FUT**-DECL   **1A**-stay-**1A.FUT**-DECL
'I will run'   'I will stay'
[Felice Big Day; 2018-17.084.004:46]   (Park 2012:410, Ex.14)

2 Inflectional paradigms

- The Crow paradigms come from my fieldwork, Wallace 1993, and Graczyk 2007. The Hidatsa verbal paradigms come from Boyle and Gwin 2005, Boyle 2007, and Park 2012.

2.1 WILL

Crow *-ii* 'will'				Hidatsa *-hi* 'will'			
1SG	-bii	1EXCL	-bii-lu	1SG	-wi	1PL	-wihi-a
2SG	-dii	2PL	-dii-lu	2SG	-ri	2PL	-rihi-a
3SG	†-ii	3PL	†-ii-lu	3SG	-hi	3PL	hi-a

2.2 ARRIVE (THERE)

Crow *híi* 'arrive'				Hidatsa *híi* 'arrive'			
1SG	baá	1PL	bií-o	1SG	†máahii	1PL	†máahii-a
2SG	daláa	2PL	dalií-o	2SG	†nárahii	2PL	†nárahii-a
3SG	híi	3PL	dií-o	3SG	híi	3PL	†náahii-a

2

	Osage		
	ahí ∼ *hí* 'arrive there'		
1SG	pš-**í**	1PL	ąk-**ahí** api
2SG	š-**í**	2PL	š-**í** api
3SG	**ahí**	3PL	**ahí** api
	Source: Quintero 1997		

	Omaha		
	ahi ∼ *hi* 'arrive there'		
1SG	p-**hí**	1PL	ąg-**áhi**=i
2SG	š-**í**	2PL	š-**í**=i
3SG	**(a)hí**	3PL	**ahí**=i
	Source: Koontz 2001		

	Lakota		
	í 'arrive there'		
1SG	wa-**í**	1PL	ų-**í**-pi
2SG	ya-**í**	2PL	ya-**í**-pi
3SG	**í**	3PL	**í**-pi
	Sources: B&D, R&T, U 2018		

	Mandan		
	hí 'arrive there'		
1SG	wa-**hi**	1PL	rų-**hi**
2SG	ra-**hi**	2PL	ra-**hi**-rįt
3SG	**hi**	3PL	**hi**-kre
	Source: Kasak 2019		

2.3 COME

	Crow		
	húu 'come'		
1SG	boó	1PL	buú-o
2SG	dalóo	2PL	daluú-o
3SG	húu	3PL	duú-o

	Hidatsa		
	húu 'come'		
1SG	máahuu	1PL	máahuu-a
2SG	nárahuu	2PL	nárahuu-a
3SG	húu	3PL	náahuu-a

2.4 GO

	Crow		
	dée 'go'		
1SG	baalée	1PL	baá-u
2SG	dalée	2PL	dalaá-u
3SG	dée	3PL	daá-u

	Hidatsa		
	née 'go'		
1SG	maarée	1PL	máahii-a
2SG	narée	2PL	nárahii-a
3SG	née	3PL	náahii-a

	Osage		
	aðé 'go'		
1SG	b-**ðé**	1PL	ąk-**aðá** api
2SG	š-**ðé**	2PL	š-**ðá** api
3SG	**aðé**	3PL	**aðá** api
	Source: Quintero 1997		

	Omaha		
	ðé 'go'		
1SG	b-**ðé**	1PL	ąk-**áða**=i
2SG	š-**né**	2PL	š-**na**=í
3SG	**ðé**	3PL	**aða**=í
	Source: Rankin 2008		

	Lakota		
	yÁ 'go'		
1SG	bl-**é**	1PL	ų-**yá** pi
2SG	l-**é**	2PL	l-**á** pi
3SG	**yé**	3PL	**yá** pi
	Source: Rood and Taylor 1996		

	Mandan		
	reeh 'go'		
1SG	wa-**reeh**	1PL	rų-**reeh**
2SG	ra-**reeh**	2PL	ra-**reeh**-rįt
3SG	**reeh**	3PL	**reeh**=kre
	Source: Kasak 2019		

2.5   Crow modal auxiliaries

<p align="center"><i>-ii</i> 'will'</p>

1SG	*-b-ii*	1EXCL	*-b-ii-lu*
		1INCL	*-b-oo*
2SG	*-d-ii*	2PL	*-d-ii-lu*
3SG	—	3PL	—

<p align="center"><i>-iih</i> 'may, might'</p>

1SG	*-b-iih*	1PL	*-b-ooh*
2SG	*-d-iih*	2PL	*-d-ooh*
3SG	*-iih*	3PL	*-ooh*

<p align="center"><i>-iishdaachi</i> 'should'</p>

1SG	*-b-iishdaachi*	1PL	*-b-ii-lu-shdaachi*
2SG	*-d-iishdaachi*	2PL	*-d-ii-lu-shdaachi*
3SG	*-iishdaachi*	3PL	*-ii-lu-shdaachi*

<p align="center"><i>-iimmaachi</i> 'will, must'</p>

1SG	*-b-iimmaachi*	1PL	*-b-oommaachi*
2SG	*-d-iimmaachi*	2PL	*-d-oommaachi*
3SG	*-iimmaachi*	3PL	*-oommaachi*

3   Additional information

3.1   Historical changes

3.1.1   Sound changes

- The Crow sound changes from Proto-Crow-Hidatsa (PCH) that are necessary to understand the development of the irregular Crow verbal paradigms of 'arrive' and 'come' are given below. These two sound changes occur in the order given. That is, loss of *h* happens before vowel assimilation.

  1. Loss of *h* in onset position of unaccented/unstressed syllables
  2. Vowel assimilation following loss of *h*

MOUSE

	Crow		Hidatsa
Stage 1.	*íituha		*íituha
Stage 2.	*íisahu	(*t > s)	íituha
Stage 3.	*íisau	(loss of h)	
Stage 4.	íisuu	(vowel assimilation)	

INSIDE

	Crow		Hidatsa
Stage 1.	*áwahuu		*áwahuu
Stage 2.	*áwauu	(loss of h)	áwahuu
Stage 3.	*áwuu	(vowel assimilation)	
Stage 4.	awuú	(accent shift)	

3.1.2   Filling the gaps for the paradigm of Hidatsa *híi* 'arrive'

- Based on the similarities between the Crow forms for 'arrive' and 'come' and the correspondences between the Hidatsa forms for 'come', the Hidatsa forms for 'arrive' can be reconstructed in the following way:

Crow *híi* 'arrive'			
1SG	baá	1PL	bií-o
2SG	daláa	2PL	dalií-o
3SG	híi	3PL	dií-o

Hidatsa *híi* 'arrive'			
1SG	†**máahii**	1PL	†**máahii-a**
2SG	†**nárahii**	2PL	†**nárahii-a**
3SG	híi	3PL	†**náahii-a**

Crow *húu* 'come'			
1SG	boó	1PL	buú-o
2SG	dalóo	2PL	daluú-o
3SG	húu	3PL	duú-o

Hidatsa *húu* 'come'			
1SG	máahuu	1PL	máahuu-a
2SG	nárahuu	2PL	nárahuu-a
3SG	húu	3PL	náahuu-a

- First, I analyze the following diachronic stages for 'I come' in Crow and Hidatsa from PCH *wáahuu*:

	Crow		*Hidatsa*	
Stage 1.	*wáahuu		*wáahuu	
Stage 2.	*wáauu	(loss of *h*)	máahuu	(*w > m / #__)
Stage 3.	*wóo	(vowel assimilation)		
Stage 4.	bóo	(*w > b / #__)		

- The same diachronic processes can be applied to PCH *wáahii* 'I arrive' resulting in the Hidatsa form *máahii*:

	Crow		*Hidatsa*	
Stage 1.	*wáahii		*wáahii	
Stage 2.	*wáaii	(loss of *h*)	†máahii	(*w > m / #__)
Stage 3.	*wáa	(vowel assimilation)		
Stage 4.	báa	(*w > b / #__)		

- The unusual Crow plural forms for 'arrive' and 'come' are discussed in §3.1.3. The second person and the third person plural forms are discussed in §3.1.4.

3.1.3 Precursors of plural 'arrive' and 'come' in Crow

- Based on the fact the proposed forms for plural of 'arrive' in Hidatsa are the same as the plural forms of 'go', I argue that the plural forms for 'go' in Crow are the precursor to the plural forms of 'arrive' in Crow.

Crow *híi* 'arrive'			
1SG	baá	1PL	***baá-u > bií-o**
2SG	daláa	2PL	***dalaá-u > dalií-o**
3SG	híi	3PL	***daá-u > dií-o**

Hidatsa *híi* 'arrive'			
1SG	†máahii	1PL	†máahii-a
2SG	†nárahii	2PL	†nárahii-a
3SG	híi	3PL	†náahii-a

5

Crow			
dée 'go'			
1SG	baalée	1PL	**baá-u**
2SG	dalée	2PL	**dalaá-u**
3SG	dée	3PL	**daá-u**

Hidatsa			
née 'go'			
1SG	maarée	1PL	máahii-a
2SG	narée	2PL	nárahii-a
3SG	née	3PL	náahii-a

- First, the third person plural form for 'arrive' undergoes the same diachronic stages as the first and second singular forms resulting in *daá-u* in Stage 4b. Note that in Stage 4b, the forms for 'they arrive' and 'they go' are homophonous and it may be homophony avoidance that these two forms eventually become distinct. In Stage 5, the third person plural form is "contaminated" by its singular counterpart, *híi*, and becomes *dií-o*. (The plural morpheme exhibits significant contextual allomorphy with the preceding segments.)

> h**íi** : d**íi**-o ⇐ h**íi** 'he/she arrives' : d**aá**-o 'they arrive'

	Crow		*Hidatsa*
Stage 1.	*ráahii-a		*ráahii-a
Stage 2.	*ráaii-a	(loss of *h*)	†náahii-a (*r > n / #__)
Stage 3.	*ráa-a	(vowel assimilation)	
Stage 4a.	*ráa-u	(plural *a > u)	
Stage 4b.	*dáa-a	(*r > d / #__)	
Stage 5.	dií-o	(contamination)	

Crow			
híi 'arrive'			
1SG	baá	1PL	*baá-u
2SG	daláa	2PL	*dalaá-u
3SG	híi	3PL	***daá-u** > **dií-o**

- Then, the stems of the first and second person plural forms for 'arrive' level to the third person plural forms. (The singular stems display an alternating pattern, so extension is likely not involved.)

Crow			
híi 'arrive'			
1SG	baá	1PL	***baá-u** > **bií-o**
2SG	daláa	2PL	***dalaá-u** > **dalií-o**
3SG	híi	3PL	**dií-o**

- The pattern of 'arrive' is used as a base for the paradigm of 'come'. Specifically, I suggest that the third person stem changed from **doó-u* to *duú-o* via proportional analogy:

> híi : dií-o :: húu : X, X = duú-o

- Subsequently, the first and second person plural forms undergo stem leveling to the third person plural form resulting in the following paradigm for Crow:

Crow					Hidatsa			
húu 'come'					*húu* 'come'			
1SG	boó	1PL	*boó-u > buú-o		1SG	máahuu	1PL	máahuu-a
2SG	dalóo	2PL	*daloó-u > daluú-o		2SG	nárahuu	2PL	nárahuu-a
3SG	húu	3PL	*doó-u > duú-o		3SG	húu	3PL	náahuu-a

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3.1.4 The 2SG, 2PL, and 3PL forms for 'arrive' and 'come'

- The Proto-Siouan form for 'arrive here' *re-hii has the prefix *re- 'here, now' (Rankin et al. 2015). The 2SG, 2PL, and 3PL forms for 'arrive' suggest that this prefix has become part of the verbal stem for at least one of the forms – the second person plural.

- Unlike many other Siouan languages, Crow and Hidatsa do not distinguish between 'arrive here' and 'arrive there', so it is possible that the paradigms for 'arrive here' and 'arrive there' merged during PCH. That is, some forms display reflex of *re- and some do not.

- The PCH form *ra-hii-a can be interpreted as either 'you (pl.) arrive' or 'they arrive'. As the 2PL form, *ra- is the second person active prefix but as the 3PL *ra- is the proximal spatial/temporal deictic element.

- I suggest that in PCH, the 2PL form of 'arrive' became *rá-rahii-a while the 3PL form remained as *rahii-a due to homophony avoidance. However, it is not clear to me why the 3PL in PCH did not become *híi-a – the reason may lie in the contexts of use between *híi-a and *ráhii-a 'they arrive'.

PS	PCH	Crow	Hidatsa	GLOSS
*ya-**re**-híi api	*rá-**ra**hii-a	*rárahii-a > *ráraii-a > *dálaa-u > dalií-o	†nárahii-a	'you (pl.) arrive'
***re**-híi api	***rá**hii-a	*ráhii-a > *ráii-a > *dáa-u > dií-o	†náahii-a	'they arrive'

- Next, I analyze the 2SG form leveling to the 2PL form in order to match the phonological shape of their stem. (It is also possible to analyze the deictic element *ra- analyzed as part of the stem.)

PS	PCH	Crow	Hidatsa	GLOSS
*ya-(re-)híi	***rá-hii** > ***rá-rahii**	*rárahii > *ráraii > daláa	†nárahii	'you arrive'

- Finally, the inflectional pattern of 'arrive' is extended to 'come' such that the 2SG, 2PL, and 3PL forms acquired the initial *ra- on their stems. (Rankin et al. 2015 do not reconstruct PS 'come' with the deictic *re- prefix as no other Siouan languages show reflexes of this prefix.)

PS	PCH	Crow	Hidatsa	GLOSS
*ya-húu api	*rá-**ra**huu-a	*rárahuu-a > *rárauu-a > daluú-o	nárahuu-a	'you (pl.) come'
*húu api	***rá**huu-a	*ráhuu-a > *náuu-a > dúu-o	náahuu-a	'they come'
*ya-húu	*rá-**ra**huu	*rárahuu > *rárauu > dalóo	nárahuu	'you come'

- The diachronic stages for 'you (pl.) arrive' are given below.

	Crow			*Hidatsa*	
Stage 1.	*yá-re-híi api			*yá-re-híi api	
Stage 2a.	*yá-ra-hii api	(*re- > *ra-)		*yá-ra-hii api	(*re- > *ra-)
Stage 2b.	*yá-rahii api	(morphological reanalysis)		*yá-rahii api	(morphological reanalysis)
Stage 2c.	*yá-rahii-a	(reduction of plural)		*yá-rahii-a	(reduction of plural)
Stage 2d.	*rá-rahii-a	(*y > *r)		*rá-rahii-a	(*y > *r)
Stage 3.	*rá-raii-a	(loss of *h*)		*ná-rahii-a	(*r > n / # __)
Stage 4.	*rá-raa-a	(vowel assimilation)			
Stage 5a.	dá-laa-a	(*r > d / # __ and *r > l / V__V)			
Stage 5b.	dá-laa-u	(plural *a > u)			
Stage 5c.	da-láa-u	(accent shift)			
Stage 6.	da-líi-o	(stem leveling to the 3PL form)			

3.1.5 Plural suffix *-lu* on future *-ii*

- Although there are differences between the plural forms across the modals, I argue that the plural forms of future *-ii* had previously been *-oo* with *-lu* as a reflex of a more recent change.

- In addition, the gaps in the future paradigm for third person in contemporary Crow can be 'reconstructed' as *-ii* and *-iilu*.

Pre-Crow

1SG	*-b-ii*	1PL	*-b-oo*
2SG	*-d-ii*	2PL	*-d-oo*
3SG	*-ii*	3PL	***-oo***

Contemporary Crow

1SG	*-b-ii*	1EXCL	*-b-ii-lu*
		1INCL	*-b-oo*
2SG	*-d-ii*	2PL	*-d-ii-lu*
3SG	†*-ii*	3PL	†*-ii-lu*

Stage 1. The plural forms of future *-ii* are adopted as part of the plural forms for *-iih* and *-iimmaachi*.

-ii 'will'

1SG	*b-ii*	1PL	***b-oo***
2SG	*d-ii*	2PL	***d-oo***
3SG	*-ii*	3PL	***-oo***

-ii-h 'may, might'

1SG	*b-ii-h*	1PL	***b-oo**-h*
2SG	*d-ii-h*	2PL	***d-oo**-h*
3SG	*-ii-h*	3PL	***-oo**-h*

-ii-mmaachi 'must'

1SG	*b-ii-mmaachi*	1PL	***b-oo**-mmaachi*
2SG	*d-ii-mmaachi*	2PL	***d-oo**-mmaachi*
3SG	*-ii-mmaachi*	3PL	***-oo**-mmaachi*

Stage 2. The *-lu* suffix was brought into the paradigm of future *-ii* via proportional analogy: *ii* HAB.SG : *iilu* HAB.PL :: *ii* FUT.SG : X, X = *iilu* FUT.PL

-ii 'will'

1SG	*b-ii*	1PL	*b-oo*
2SG	*d-ii*	2PL	*d-oo*
3SG	*-ii*	3PL	*-ii-**lu***

Stage 3. The third-person *-ii/-iilu* alternation is extended to the first and second person resulting in the plural marker *-lu* to be used for all persons. (The exclusive/inclusive distinction also emerges.)

<div align="center">

-ii 'will'

1SG	*b-ii*	1EXCL	***b-ii-lu***
		1INCL	*b-oo*
2SG	*d-ii*	2PL	***d-ii-lu***
3SG	*-ii*	3PL	***-ii-lu***

</div>

Stage 4. The plural forms of future *-ii* are adopted as part of the plural forms *-iishdaachi*.

<div align="center">

-ii-shdaachi 'should'

1SG	*b-ii-shdaachi*	1PL	***b-ii-lu****-shdaachi*
2SG	*d-ii-shdaachi*	2PL	***d-ii-lu****-shdaachi*
3SG	*-ii-shdaachi*	3PL	***-ii-lu****-shdaachi*

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Stage 5. The third person forms of future *-ii* are lost due to homophony avoidance with the habitual *-ii*. See §3.1.6 for an explanation of why the loss of third person future occurs at this particular stage rather than earlier.

<div align="center">

-ii 'will'

1SG	*b-ii*	1EXCL	*b-ii-lu*
		1INCL	*b-oo*
2SG	*d-ii*	2PL	*d-ii-lu*
3SG	—	3PL	—

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3.1.6 Pathways to future

- I proposed that the Crow habitual *-ii* (plural *-iilu*) suffix provided the model for proportional analogy for the future suffix *-ii*. I also proposed that homophony avoidance with the habitual led to the disuse of the third person forms for *-ii*. Why should proportional analogy occur at all? Why does homophony avoidance not occur earlier?

- I suggest that proportional analogy occurred before *-bia* 'want to, will' and *-iimmaachi* 'must, will' came to also express future semantics. Disuse of third person *-ii* was motivated in part by the fact that there were now alternative ways of expressing future meaning.

- The desiderative *-bia*, which may also express future, is cognate with Hidatsa *míihee ∼ maaíihee* 'want to' and 'inferred future' (Park 2012:257). A common source of the future is words expressing desire (Bybee et al. 1994, Heine and Kuteva 2002). Thus, I suggest that in Crow, *-bia* 'want to' over time also acquired future meaning.

	Crow		*Hidatsa*
Stage 1.	*waa-íihee		*waa-íihee
Stage 2.	*wíihee	(syncope)	míihee ∼ maaíihee (*w > m / #__)
Stage 3.	*wíi-hee	(reanalysis of *hee* as a direct causative)	
Stage 4.	*wíi-a	(direct causative *-hee* > -a*)	
Stage 5.	-bia	(*w > b / #__)	

- Another common source of the development to future is obligation. In the same vein, I propose that *-iimmaachi* first came to express strong obligation extending its use in also expressing the future.

- Thus, in the following schema, at Stage 3 when proportional analogy occurs with habitual *-ii*, *-bia* and *-iimmaachi* have yet to develop to encode future meaning. Once they do (Stage 4), the third person forms of future *-ii* eventually fall out of use (Stage 5).

Stage 1.	*-ii* 'he/she will'	*-oo* 'they will'	*-bia* 'want to'	-ii 'will' + -waachi 'emph. imper.'
Stage 2.	*-ii* 'he/she will'	*-oo* 'they will'	*-bia* 'want to'	***-iimmaachi* 'must'**
Stage 3.	*-ii* 'he/she will'	***-iilu* 'they will'**	*-bia* 'want to'	*-iimmaachi* 'must'
Stage 4.	*-ii* 'he/she will'	*-iilu* 'they will'	*-bia* 'want to, **will**'	*-iimmaachi* 'must, **will**'
Stage 5.	—	—	*-bia* 'want to, will'	*-iimmaachi* 'must, will'

3.1.7 Development of modals

- In Crow, the future suffix *-ii* always directly precedes the clause-final markers, which typically specify speech act type (e.g. declarative, imperative, interrogative, etc.). In what follows, I present current speculations as to how the modals *-iimmaachi*, *-iih*, and *-iishdaachi* emerged.

   ▷ **-ii* + **-waachi* > -iimmaa(chi) 'must, will'

      future + emphatic imperative > strong obligation > future

According to Graczyk (2007:153), the emphatic imperative *-wah* may be used to add "a note of insistence: 'do it or else!'" The development of (strong) obligation (and subsequently future) can plausibly be explained through the combination of the future marker with the emphatic imperative. Specifically, the combination of the two may give rise to interpretations that eventually lead it to be used as a deontic necessity modal (i.e. obligations according to a set of rules or desires). Moreover, the morpheme may be extended to also express epistemic necessity modality (i.e. obligations according to evidence or reasoning); when used in the present or past contexts, it may indicate inferred certainty. Obligation can also be a precursor for future meaning to develop (Bybee et al. 1994, Heine and Kuteva 2002).

   ▷ **-ii* + **-h* > -iih 'may, might'

      future + simple imperative > epistemic possibility

The development of epistemic possibility meaning plausibly arises through the combination of the future with the simple imperative. The combination of the future with the imperative *-h* is naturally future-projecting and unlike its emphatic counterpart, the simple imperative may indicate a suggestion or a mild directive. Thus, whether the addressee will fulfill and carry out the directive is not certain but may be ascertained, allowing for the direct path to epistemic possibility.

   ▷ **-ii* + **-shdaachi* > -iishdaachi 'should'

      future + strong assertion > weak obligation

Hidatsa and Crow have a suffix that is used to express strong assertion (Park 2012:231, Graczyk 2007:394). In Hidatsa, the suffix may appear as *-s*, *-sd*, or *-shaa*[?] and in Crow, it may appear as *-sht*. The development of (weak) obligation can be understood to arise from a sense of what is to be

(Bybee et al. 1994). The combination of future and strong assertion projects the activity into the future, providing a sense of obligation for the agent to realize his or her destiny. Unlike *-iimmaachi* which expresses strong obligation through future with an emphatic imperative, combining future with a marker of strong assertion gives way to weak obligation.

3.1.8   Development of desiderative *-isshi*

- The diachronic stages of *-isshi* 'eager to' in Crow from Proto-Siouan-Hidatsa are presented below.

Stage 1. *-hti

Stage 2. *-shi (*t > sh)

Stage 3. *i-sshi (morphological reanalysis)

(13)   Affix secretion (Haspelmath 1995)

      a.   *xyz → xyz-a*
             R ⇒ *-za*
       ⇒ new suffix *-za*

      b.   *eeláxi → eeláxi-sshi* 'eager to urinate'
        'urinate'   R ⇒ *-isshi*
       ⇒ new suffix *-isshi*,
       e.g. *baa-lisshí-w-**isshi**-k* 'I want to dance' [Riley Singer; 2018-17.029.001:41]

Stage 4. Extension of alternating pattern to a formerly non-alternating pattern.

	'will'	'may, might'	'must, will'	'should'	'eager to'
1SG	**-b**-ii	**-b**-iih	**-b**-iimmaachi	**-b**-iishdaachi	**-b**-isshi
2SG	**-d**-ii	**-d**-iih	**-d**-iimmaachi	**-d**-iishdaachi	**d**-isshi
3SG	-ii	-iih	-iimmaachi	-iishdaachi	-isshi

3.2   Modals in Crow

- The Crow modals *-iimmaa(chi)*, *-iishdaachi*, and *-iih* share similar meanings as English *must*, *should*, and *may*, respectively. For example, similar to *must*, *-iimmaachi* is used to express necessity or strong obligation regardless of the modal base which is provided by the context. A deontic modal base indicates that the statement accords with the set of rules, desires, or norms, while an epistemic one indicates that it accords with the speaker's belief, evaluation, or confidence in the statement)or proposition). A sketch of the modal space of Crow is provided below.

	NECESSITY	WEAK NECESSITY	POSSIBILITY
DEONTIC	*-iimmaa(chi)*	*-iishdaachi*	*...dak kootíimmaa*
EPISTEMIC			*-iih*

Table 1: A sketch of the modal space of Crow.

- In what follows, I provide examples that give support to the organization of the modal space of Crow shown in Table 1. To accomplish this task, I employed a modal questionnaire (Vandler Klok 2014) and storyboards (Burton and Matthewson 2015) that target certain modals based on a particular context. I supplement the findings with data from previously documented texts (e.g. Lowie's 1960 *Crow Texts*).

3.2.1   *-iimmaachi* 'must, will'

- Context [necessity epistemic]: The math teacher says: The ball is in A or in B or in C. It is not in A. It is not in B. So, (it must be in C.)

  (14)   éehk búupche C kool-íimma
         that   ball   C be.there-ɪɪᴍᴍᴀᴀᴄʜɪ
         'that ball must be in C'   [Riley Singer; 2018-17.084.001:2]

- Context [weak necessity epistemic]: You know that Logan works from 8am-12pm every morning. He usually doesn't miss a day of work. It's now 9am. You say: (Logan SHOULD be working now.)

  (15)   Logan baahil-íimmaa
         Logan work-ɪɪᴍᴍᴀᴀᴄʜɪ
         'Logan should be working now'   [Jack Real Bird; 2018-17.084.001:9]

- Context [necessity deontic]:

  ▷ Logan is in a library. (Logan must be quiet.)

  (16)   Logan chichítseetchee-mmaa
         Logan be.quiet-ɪɪᴍᴍᴀᴀᴄʜɪ
         'Logan must be quiet'   [Felice Big Day; 2018-17.084.001:9]

  ▷ Lowie: The next day [the man and his wife] went and reached the dwarf's house. [The dwarf] came out to meet them. He had a fire and they stayed there. "That wife of yours is pregnant, **she cannot enter our house**. Do you enter alone," said he, "come." (Lowie 1918:172)

  (17)   ko   bale-aasúua   biléeli-ssaa-iimmaachi-k
         ᴘʀᴏ 1ᴘʟ.ᴘᴏs-house enter-ɴᴇɢ-ɪɪᴍᴍᴀᴀᴄʜɪ-ᴅᴇᴄʟ
         'she cannot enter our house' (Lowie 1960:86)

- Context [necessity circumstantial]: You are driving and you haven't looked at your gas tank for quite some time. You notice that your gas is nearly empty. You think: (I NEED to get gas.)

  (18)   taláa-m   bu-lutche-w-iimmaa
         gas-ɪɴᴅᴇꜰ 1ᴀ-get-1ᴀ-ɪɪᴍᴍᴀᴀᴄʜɪ
         'I need to get gas'   [Jack Real Bird; 2018-17.084.001:25]

3.2.2   *-iishdaachi* 'should'

- Context [weak necessity deontic]: Logan is the oldest child, and he is not yet married. His younger brother, Taylor, wants to get married. But according to social norms, (the oldest OUGHT TO marry first.)

  (19) héela   baa-isaa   koochík bach-axpi-ilu-shdaachi-k
        among INDEF-big first   RECIP-marry-PL-ISHDAACHI-DECL
        'the oldest ones should marry first'   [Felice Big Day; 2018-17.084.001:43]

- Context [weak necessity epistemic]: You are not living in Lodge Grass anymore. You notice how different it is with the weather in Australia, where you live right now. You know that in Pryor it's the winter now, and there's often snow every afternoon. Now it's 3pm, so...(It SHOULD be snowing in Lodge Grass)

  (20) Bínneete   kon bíihp-ishdaachi-k
        Lodge.Grass LOC snow-ISHDAACHI-DECL
        'It should be snowing in Lodge Grass'   [Jack Real Bird; 2018-17.084.001:9]

3.2.3   *-iih* 'may, might'

- Context [possibility epistemic]: Teacher Logan is not consistent. The students never know if he's going to come or not to give a lecture. Today, it's time to start class and the students are waiting again. (He MIGHT be coming to the school today.)

  (21) Logan (aaláa) balee-híi-h
        Logan perhaps 1B.PL-meet-IIH
        'Logan might meet us'   [Riley Singer; 2018-17.084.001:2]

- Context [possibility epistemic]: Logan is looking for her necklace. She's not sure if she lost it or if it is somewhere in the house because she doesn't remember the last time she wore the necklace. She looks in her wardrobe and on top of the wardrobe. It's not there. She looks on top of the TV. It's not there. She looks in her backpack. It's not there. Wait! She didn't check her sister's wardrobe yet...(Logan's necklace MIGHT be lost.)

  (22) Logan aapíia   (aaláa) xapíi-h
        Logan necklace perhaps lose-IIH
        'Logan's necklace might be lost'   [Riley Singer; 2018-17.084.001:2]

- Context [possibility epistemic]: Logan's parents told him that he is not allowed to go to see his friend in London because it is too far away. You heard that Logan is leaving Wyola next week, but you don't know where he will go. Logan is a daring type of guy that usually does things that he is not permitted to do. You think: (Logan MAY go to London.)

  (23) Logan (aaláa) London kuss   dée-h
        Logan perhaps London towards go-IIH
        'Logan might go to London'   [Felice Big Day; 2018-17.084.001:43]

13

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