

Refining the Phonological Analysis of Ojibwe Nominal Inflection Classes

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One well-known property of morphology is ALLOMORPHY: that the particular surface realization of a single morpheme can differ depending on the surrounding morphophonological context. For example, the English regular plural marker alternates between [s], [z], and [ɪz] depending on phonological properties of the stem to which it attaches. One major project in linguistics is to provide the most general account possible of these types of alternations, usually in the form of independently motivated rules or constraints that transform some underlying representation into the form that appears on the surface. The goal of this paper is to advance a general account of the allomorphy present within nominal inflection in Ojibwe (Central Algonquian)—in particular the variety known as Southwestern Ojibwe, spoken in what is now Minnesota, Wisconsin, North Dakota, and parts of Northwestern Ontario.

Nouns can be inflected with morphemes encoding a wide variety of different functions, including markers for person, possession, plurality, location, diminutive, pejorative, possession, and obviation as exemplified in (1) (Nichols 2011; *Ojibwe People's Dictionary* 2021).

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|-----|---------------------|-----------------------|----------------------------|
| (1) | a. ni-jiimaan-inaan | 'our boat' | person (PER) |
| | b. ni-zhiishiib-im | 'my duck' | possessive (POSS) |
| | c. aninishib-ag | 'mallards' | animate plural (PL.ANIM) |
| | d. abwaan-an | 'roasts' | inanimate plural (PL.INAN) |
| | e. ishkode-ng | 'in, at, to the fire' | locative (LOC) |
| | f. jiimaan-ens | 'small boat' | diminutive (DIM) |
| | g. odaaban-ish | 'no-good car' | pejorative (PEJ) |
| | h. noos-iban | 'my late father' | preterit (PRET) |
| | i. ikwew-an | 'woman' | obviative (OBV) |

This paper is not focused on the meaning or use of these morphemes (for a general overview, see Valentine 2001), but rather mapping and understanding the various forms that they can take. For illustrative purposes, let us temporarily set aside the fact that the addition of pieces of morphology might in fact condition changes to the stem rather than the stem giving rise to a change in the morpheme, and consider the surface range of the animate plural morpheme, as exemplified in (2). We see that plural marking on animate nouns is associated with no less than six different surface forms (*-ag*, *-yag*, *-g*, *-wag*, *-oog*, *-iig*), which are only united by the shared presence of the segment /g/.

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|-----|-------------------------|------------|----------------|
| (2) | a. zhiishiib 'duck' | + [plural] | = zhiishiibag |
| | b. giigoonh 'fish' | + [plural] | = giigoonhyag |
| | c. anishinaabe 'Ojibwe' | + [plural] | = anishinaabeg |
| | d. inini 'man' | + [plural] | = ininiwag |
| | e. mitig 'tree' | + [plural] | = mitigooog |
| | f. asin 'stone' | + [plural] | = asiniig |

The realization of different forms has led to the descriptive project of sorting nouns into *classes* based on shared inflectional patterns (e.g., Nichols 1980; Valentine 2001; Nichols 2011). For example, nouns where the animate plural marker appears as *-oog* (2e) are sorted into class 4a, while nouns where the animate plural marker appears as *-iig* (2f) are in class 5 (Nichols 2011). For our purposes, noun classes are the starting point for understanding the basic patterns of nominal inflection in Ojibwe. In the next section, we turn to describing the full range of noun classes to set the stage for a rule-based analysis.

Ojibwe Noun Classes

Noun stems in Ojibwe can be inflected using one of twelve paradigms. Many of these paradigms are similar to one another, save one or two morphemes. However, all inflectional paradigms can be definitively identified by observing the patterns in the following three forms: (1) the singular, which is unmarked (though see discussion below), (2) the plural, which ends in <g> (IPA: /g/) if animate or <n> (IPA: /n/) if inanimate, and (3) the pejorative, which ends in <sh> (IPA: /ʃ/) (Nichols 1980; Valentine 2001; Nichols 2011).¹ These forms are exemplified for each class in example (3).

(3)	Class	SG	PL	PEJ
1	a.	esiban 'raccoon'	esibanag	esibanish
	b.	mish-i 'firewood'	mishan	mishish
	c.	giigoonh 'duck'	giigoonhyag	giigoonhyish
2	a.	anishinaabe 'Ojibwe'	anishinaabeg	anishinaabewish
	b.	ikwe 'woman'	ikwewag	ikwewish
3		inini 'man'	ininiwag	ininiwish
4	a.	mitig 'stick'	mitigoog	mitigosh
	b.	amik 'beaver'	amikwag	amikosh
	c.	makw-a 'bear'	makwag	makosh
5		asin 'stone'	asiniig	asiniish
6		mashkimod 'bag'	mashkimodan	mashkimodaash

Class 1 is characterized by consonant-final UNDERLYING stems. At first, this may be surprising when considering the examples in (3), since only Class 1a nouns have singular forms that end in a consonant—Class 1b singular forms end in a short vowel, and Class 1c singular forms end in a long, nasalized vowel. However, in all three cases, Nichols (1980) treats the underlying stem as consonant final. The reasoning is as follows: All Class 1b nouns are disyllabic, and their final vowel is always dropped in suffixed forms; therefore, Nichols assumes that the singular form is derived from a monosyllabic stem, to which a vowel is inserted in the singular to prevent an illegal monosyllabic word. Class 1c nouns are assumed to end in an underlying /y/ (IPA: /j/), which gets predictably deleted in the singular form, but remains in all suffixed forms.

Class 2 is characterized by surface stems that end in a long, non-nasalized vowel. Classes 2a and 2b differ only in plural and obviative forms: Class 2a shows only the final consonant of the suffix, whereas in Class 2b a <w> surfaces before the suffix's initial vowel. Nichols assumes both stems end in an underlying /w/, which must undergo deletion in certain cases since the /w/ does surface in other suffixed forms (1980, 2011). Valentine (2001) does not distinguish 2a and 2b inflectional paradigms; instead, all such stems are treated as long-vowel final, and some Class 2 nouns ending in <e> are grouped into Class 3. This difference in classification is possibly dialectal, since Valentine describes Nishnaabemwin rather than Southwestern Ojibwe.

Class 3 is characterized by a final short vowel in the surface stems. Both Nichols (1980, 2011) and Valentine (2001) assume an underlying /w/ after the short vowel. Other than vowel length, Class 3 stems show the same surface pattern with <w> as Class 2b. For this reason, Nichols only distinguishes Class 3 from Class 2 in later accounts (Nichols 2011).

Class 4 is characterized by a word-final /g/ or /k/ on the surface, which underlying is widely agreed to be followed by a /w/ (Nichols 1980; Valentine 2001; Nichols 2011). Class 4a behaves predictably; Classes 4b and 4c differ only in the plural and obviative, in which the <oo> is replaced by [wa]. Interestingly, stems ending in the same root may not fall in the same class: *amik* 'beaver' and *zaasagokwaanamik* 'fried beaver' are Class 4b, but *waabamik* 'albino beaver' is Class 4a for the same speaker (speaker initials NJ; *Ojibwe People's Dictionary* 2021). Class 4c is similar to 1b in that all singular forms are disyllabic due to the insertion of a final vowel, which does not occur in the suffixed forms.

Class 5 is characterized by suffixed forms that begin with <ii>. Both Nichols (1980, 2011) and Valentine (2001) assume an underlying /y/ (IPA: /j/) at the end of the stem, which gets deleted in singular forms and coalesces with following vowels in the suffixed forms.

Class 6 consists of a small set of irregular consonant-final nouns, which include an 'aa-augment' [-aa-] in all but the diminutive and plural forms (preterit and obviative are unattested in currently available data).

The exact class-labeling convention varies between sources. We follow the most recent labels proposed by Nichols (2011), since they correspond one-to-one with the inflectional patterns exhibited in the language. The relations between conventions are summarized in Table 1.

TABLE 1. Correspondences between labels for the noun inflection classes in Ojibwe

NICHOLS 2011, THIS PAPER	VALENTINE 2001	NICHOLS 1980
Class 1a	Class I	Class 1.1
Class 1b	Class I	Class 1.2a–f
Class 1c	Class I	Class 1.3
Class 2a	Class II	Class 2.3
Class 2b	Class III	Class 2.2
Class 3	Class III	Class 2.1
Class 4a	Class IVa	Class 3.2a–c
Class 4b	Class IVb	Class 3.3a–b
Class 4c	Class IVb	Class 3.1
Class 5	Class V	Class 4
Class 6	Class VI	Class 5.1–5.4

A naive view (one that no modern linguist would seriously defend, and is explicitly rejected by the sources cited above) would be to take noun class labels as not just descriptively useful (which they are), but also **PSYCHOLOGICALLY REAL**, in the sense that when a speaker of Ojibwe is constructing a plural noun, they first “look up” the class of the noun, then find the allomorph associated with that class. This would mean the lexical storage of not only the class information, but also each distinct allomorph—an inefficiency—and would further make it challenging to understand how novel stems, which would not yet be assigned a class, are readily inflected by proficient speakers in a consistent manner (e.g., as made famous by the Wug Test of Berko 1958). Instead, it is generally agreed that language users store the smallest number of forms possible, and **GENERATE** allomorphs through the application of general phonological rules.

We turn to an implementation of this approach for Ojibwe noun classes in the next section.

Ingredients and Approach

The approach requires three analytical ingredients: (1) the underlying form of each suffix, (2) the underlying form of each stem, and (3) the phonological rules that

apply after suffixes are added. Because phonological rules must apply generally across the language, we keep changes to the phonology from previous accounts to an absolute minimum. Instead, we focus primarily on the possible underlying forms of both the suffixes and the stems. We have only modified phonological rules when no possible combination of underlying forms could make the right empirical predictions.

Suffixal Morphemes

Ojibwe has nine nominal suffix paradigms relevant to this paper, as previously summarized in (1). Each suffix has anywhere from four to six different surface allomorphs, almost exclusively encompassing the 0–2 sonorants at the start of the suffix (Nichols 1980; Valentine 2001; Nichols 2011).

Most affixes go unchanged from previous proposals in our analysis, but there are a few critical divergences that allow for a more general account than has previously been advanced. We treat animate plural and inanimate plural as */-ag/* and */-an/* respectively, the obviative as */-an/*, and the locative as */-ng/* (following Nichols 1980; Valentine 2001). We assume the diminutive suffix to take a form loosely transcribable as */-:ns/*, in which the preceding vowel is lengthened and nasalized.

We argue that that the person, possessive, preterit, and locative suffixes are all consonant initial rather than *i* initial (PER */-naan/*, */-waa/*, */-ni/*, POSS */-m/*, PRET */-ban/*). Nichols (1980) originally argues for this position, but in later work (Nichols 2011) reanalyzes the personal suffixes as */-inaan/*, */-iwaa/*, and */-ini/*, the possessive as */-im/*, and the preterit as */-iban/*, although the forms are sometimes used interchangeably or with the <*i*> in parentheses. The two different analyses (with versus without an initial underlying [i]) handle most of the data with about equal power, but there are important differences. If the bolded suffix in (4a) and (5a) is treated as the underlying form, then a rule is needed to DELETE the [i] for (4b) and (5b). If the suffix in (4b) and (5b) is assumed to be the underlying form, then a rule is needed to INSERT the [i] in (4a) and (5a). Which analysis is preferable depends on the underlying form of the stems. For Nichols (2011), the [i]-initial morpheme is necessary to account for the pejorative, but requires the introduction of a class-specific phonological rule. Our account works whether the [i] is part of the suffix or inserted later; however, assuming a consonant-initial suffix is helpful to explain the *aa*-augment stems (see section titled ACCOUNTING FOR THE NOUN CLASSES).

- (4) a. *jiimaan* 'boat' *ni-jiimaaninaan* 'our boat'
 b. *-iitaa-* 'brother in law' *n-iitaanaan* 'our brother in law'
- (5) a. *wiyaas* 'meat' *ni-wiyaasim* 'my meat'
 b. *ogimaa* 'boss' *nind-oogimaam* 'my boss'

Finally, we argue that the underlying form of the pejorative suffix is */-ish/*. Nichols assumes the initial [i] is epenthesized, although it doesn't make a major difference for his analysis (1980, 2011). Unlike Nichols, it is crucial for our analysis that the [i] is part of the underlying pejorative suffix because it allows us to assume a different underlying form for Class 2a stems (see the next section). This change still predicts the correct allomorphs in other classes while yielding additional explanatory power.

Underlying Stems

Once a suffix is attached, the underlying shape of the stem determines the output allomorph as it defines the context for phonological rules to apply. The shape of the stem does not necessarily correspond to the singular form: Class 1b stems gain an extra vowel in the singular form to prevent monosyllabic words, and Class 1c stems predictably lose their final /y/ when there isn't a suffix to "protect" it (Nichols 1980; Valentine 2001).

Much of our proposal is shared with Nichols (1980). Class 1 stems are assumed to be the default consonant-final stems. Class 1b stems are assumed to be monosyllabic with a vowel inserted to prevent monosyllabic words, and Class 1c is assumed to have a stem-final /y/ that gets deleted in singular forms without a suffix to shield it (see Nichols 1980). Classes 2b, 3, and 4 are still assumed to end with an underlying /w/, and Class 5 stems are still assumed to end in an underlying /y/. These assumptions alone provide predictable environments for phonological rules to apply and allow for the consolidation of several noun classes (see section titled ACCOUNTING FOR THE NOUN CLASSES).

We propose one crucial change to underlying stems: that Class 2a stems end in a long vowel WITHOUT an underlying /w/ (following Bloomfield 1958). Unlike the underlying /w/ in Classes 2b, 3, and 4, the underlying /w/ in Class 2a only appears in two environments: the pejorative and compounds (Nichols 1980), as in (6) and (7):

- (6) anishinaabewish
 Ojibwe+PEJ
 ‘no-good Ojibwe’
- (7) a. ishkotewish
 fire+PEJ
 ‘no-good fire’ (Nichols 2011)
- b. ishkotewapoo
 fire+liquid
 ‘whiskey’ (Nichols 1980)

Nichols uses this as grounds for an underlying /w/. However, this analysis renders the right boundaries of Class 2a and 2b stems identical, despite their different inflectional paradigms, and necessitates class-specific w-deletion rules (i.e., Rule P-7, see section titled PHONOLOGICAL RULES).

However, assuming Class 2a nouns end in a long vowel correctly predicts all forms except the pejorative and compounds. To generate the correct predictions, we posit a novel w-insertion rule. We turn now to the exposition of these rules.

Phonological Rules

Nichols (1980) describes 35 phonological rules, numbered P-1 to P-35. A list of the rules used in this paper can be found in Appendix 1. Because these rules must apply across the entire language, and our analysis is focused on noun class, we made only minimal changes to prevent proposing rules that have undesirable knock-on effects in other areas of the language.

Our most significant change is the introduction of a novel w-epenthesis rule, which explains the unexpected [w] in Class 2a pejoratives (6–7a) and compounds (7b) mentioned above. We label this P-36 and define it in (8).

- (8) P-36. w-Epenthesis

The /w/ is inserted after a long vowel occurring before a vowel-initial suffix or compound.

Several strategies for resolving vowel-hiatus are attested in Ojibwe (for discussion, see Newell and Piggot 2014), so the conditions triggering [w]-insertion

are not implausible. This rule is intentionally limited in scope, but is crucially not class-specific. It references only general properties, explaining the limited appearance of [w] without requiring the phonology to reference abstract class labels. So long as the rule applies before P-8, it makes the right predictions without interfering with the rest of the nominal morphology.

We make two other changes to existing rules: first, we specify that rule P-19 must occur before P-18. Nichols does not specify that the numbers correspond to rule ordering, but this is necessary for deriving Class 3 inflections. Second, we broaden rule P-30 to apply before ALL short vowels instead of just /ya/. Because we argue the pejorative takes the form /-ish/, this broadening is necessary to predict the correct form. Such a rule would also be necessary to derive the correct forms if any suffixes are presumed to begin with /i/, as in Nichols (2011).

(9) **P-30. Y-contraction (edited)**

Interconsonantal /yV/ and /y/ contract to /ii/.

Summarizing both our proposal for underlying forms and phonological rules, we make the following claims: (1) Class 2a nouns do not have an underlying /w/; instead, the /w/ is inserted to resolve vowel hiatus. (2) Only the pejorative suffix begins with /i/; in all other cases, the [i] is epenthesized. (3) An existing rule that contracts /y/ and /ya/ to [ii] between consonants (P-30) also applies to /yi/. And (4), rule P-19 occurs before rule P-18. These changes alone allow us to derive the majority of Ojibwe's noun suffix allomorphs using phonology alone, with a small class of irregular nouns being the exception.

Accounting for the Noun Classes

Although a noun's inflection cannot be determined by its surface singular form, we argue that eight of the eleven inflectional paradigms can be fully derived phonologically, namely, Classes 1–4a and Class 5. Class 4b–c cannot be derived from basic phonological rules without assuming two different kinds of underlying /w/. Class 6 consists solely of irregular aa-augment nouns; however, our modified phonological rules do provide a predictable phonological environment for aa-augmentation to occur.

The derivation of each class can be summarized in the diagram in Figure 1.

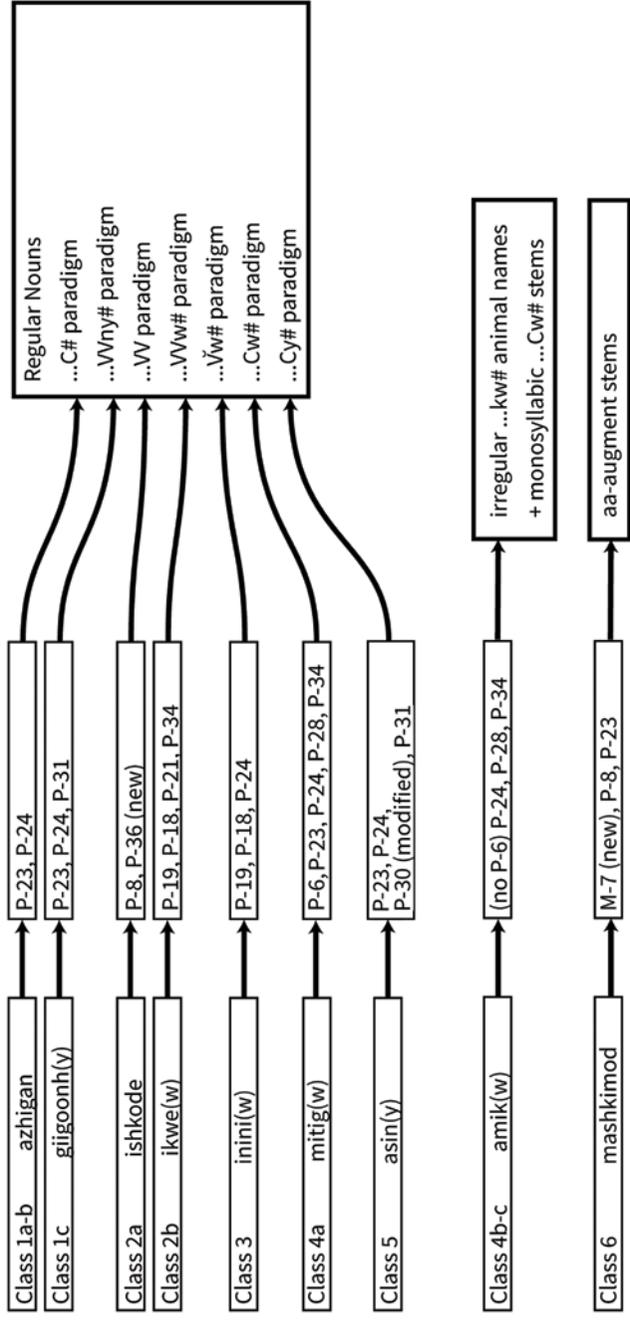


FIGURE 1. A schematization of the underlying forms of each class, and the rules that apply to derive the final surface form.

The arrows point from a class of nouns to the phonological rules that apply to their suffixed forms, then to the resulting paradigm. Most classes reduce into part of the regular paradigm, and the two exceptions remain irregular paradigms. A final note: Except when otherwise indicated, all data in this section comes from the *Ojibwe People's Dictionary* (2021).

Deriving Class 1

All Class 1 stems can be derived phonologically given our assumptions in the section titled INGREDIENTS AND APPROACH. We demonstrate this in example (10) using Class 1a stems. The plural (10c), pejorative (10f), and obviative (10h) are all vowel initial, so they attach with no phonological change. Because no vowel precedes the diminutive (10e), short non-palatalizing [e] is inserted, then lengthened (P-23). Now, only the personal (10a), possessive (10b), locative (10d), and preterit (10g) are consonant initial, so an [i] is inserted (P-24). The same process applies to Class 1b, since the singular suffix is not present in the stem.

(10) a. jiimaan 'boat'	o-jiimaan- ini 'his boat'
b. wiyaas 'meat'	ni-wiyaas- im 'my meat' (Nichols 2011)
c. azhigan 'sock'	azhigan- an 'socks (INAN)'
d. azhigan 'sock'	azhigan- ing 'sock+LOC'
e. azhigan 'sock'	azhigan- ens 'little sock' (Nichols 2011)
f. azhigan 'sock'	azhigan- ish 'no-good sock' (Nichols 2011)
g. -ookomis- 'grandmother'	nookomis- iban 'my late grandmother'
h. zhiishiib 'duck'	zhiishiib- an 'duck+OBV'

This prediction also applies to Class 1c, with the sole difference being that the /y/ that normally gets deleted in the singular is visible immediately before the suffix. Examples (11b,e,g) show suffixation with no phonological change, example (11d) demonstrates the same sort of e-insertion as (10e), and examples (11a,c,f) show the same sort of i-epenthesis as (10a,b,d,g) (Class 1c person suffixation is not in the currently available data).

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|---------|--------------------------|------------------------------------|
| (11) a. | giigoonh 'fish' | ni-giigooy-im 'my fish' |
| b. | giigoonh 'fish' | giigoonhy-ag 'fishes (ANIM)' |
| c. | giigoonh 'fish' | giigoonhy-ing 'fish+LOC' |
| d. | abinoojiinh 'child' | abinoojiiy-ens 'little child' |
| e. | giigoonh 'fish' | giigoony-ish 'no-good fish' |
| f. | mindimooyenh 'old woman' | mindimooyeny-iban 'late old woman' |
| g. | giigoonh 'fish' | giigoony-an 'fish+OBV' |

Deriving Class 2

Assuming Class 2a ends in a long vowel WITHOUT an underlying /w/ predicts very few phonological rules need apply. The suffixes in (12a,b,d,e,g) all attach without triggering any general phonological rules. Most notable is the pejorative suffix (12f), which triggers our new w-insertion rule P-36 (see section titled PHONOLOGICAL RULES). However, the plural and obviative suffixes (12c and h, respectively) fall outside the environment specified by P-36, so the initial vowel of each suffix is deleted (P-8).

- | | | |
|---------|--------------------------|--|
| (12) a. | -iitaa- 'brother-in-law' | w-iitaa-ni 'his brother-in-law' |
| b. | bimide 'grease' | ni-bimide-m 'my grease' (Nichols 2011) |
| c. | ishkode 'fire' | ishkode-n 'fires (INAN)' |
| d. | ishkode 'fire' | ishkode-ng 'fire+LOC' |
| e. | ishkode 'fire' | ishkode-ns 'little fire' |
| f. | ishkode 'fire' | ishkode-wish 'no-good fire' (Nichols 2011) |
| g. | anishinaabe 'Ojibwe' | anishinaabe-ban 'late Ojibwe' (Nichols 2011) |
| h. | anishinaabe 'Ojibwe' | anishinaabe-n 'Ojibwe+OBV' (Nichols 2011) |

This analysis explains why all suffixes except the pejorative treat the stem as vowel final: the stem is vowel final, but a very narrow phonological rule inserts a [w] before the initial vowel of the pejorative suffix can be deleted by P-8.² Treating Class 2a as vowel final thus lets us generalize Class 2b as the regular paradigm for VVw-final stems, as demonstrated in (13). Only the vowel-initial plural (13b), pejorative (13e), and obviative (13g) fail to trigger any phonological rules. The rest of the forms are consonant initial and, thus, trigger pre-non-syllabic w-loss, which deletes /w/ between a long vowel and a nonsyllabic consonant (P-21).

- (13) a. -oogimaa- 'boss' nind-oogimaa-**m** 'my boss' (Nichols 2011)
 b. ikwe 'woman' ikwew-**ag** 'women (ANIM)'
 c. ikwe 'woman' ikwe-**ng** 'woman+LOC' (Nichols 2011)
 d. ikwe 'woman' ikwe-**ns** 'little woman'
 e. ikwe 'woman' ikwew-**ish** 'no-good woman'
 f. ikwe 'woman' ikwe-**ban** 'late woman' (Nichols 2011)
 g. ikwe 'woman' ikwew-**an** 'woman+OBV' (Nichols 2011)

Deriving Class 3

Class 3 consists entirely of short-vowel-final stems followed by a /w/ that gets deleted in the singular form. All inflections can be derived from our starting assumptions in the section titled INGREDIENTS AND APPROACH, as demonstrated in (14). The vowel-initial suffixes in (14b,e,g) attach with no change. The possessive, locative, and diminutive suffixes in (14a,c,d) begin with consonant clusters or fortis consonants, which lengthen the preceding vowel (P-19). Then, the /w/ is deleted, resulting in the long vowels seen below (P-18). For this derivation to work, P-19 must occur before P-18, otherwise the /w/ deletes before P-19 can apply. These sound rules do not apply to the preterit in (14f) because /b/ is not a fortis consonant. Instead, [i] is inserted (P-24).

- (14) a. mashkikii 'pill' mashkikii-**m** 'my pill' (Nichols 2011)
 b. inini 'man' ininiw-**ag** 'men (anim)'
 c. inini 'man' ininii-**ng** 'man+loc' (Nichols 2011)
 d. inini 'man' ininii-**ns** 'little man'
 e. inini 'man' ininiw-**ish** 'no-good man'
 f. inini 'man' ininiw-**iban** 'late man' (Nichols 2011)
 g. inini 'man' ininiw-**an** 'man+OBV' (Nichols 2011)

Whether P-19 and P-18 are necessarily two separate rules is unclear. Unless there is other evidence for these rules, it may be more accurate to describe the /w/ as coalescing with the previous vowel rather than lengthening and deleting.

Deriving Class 4

Class 4a can be fully derived using general phonological rules, although every suffixation triggers at least one sound change, as demonstrated in (15). The first rule to apply occurs in the plural and obviative (15c,h): both suffixes begin with /a/, which predictably coalesces with the final /w/ of the stem (P-6). The remaining suffixes do not begin with /a/, so short /e/ is inserted before the diminutive in (15e) (P-23) and short /i/ is inserted before the remaining consonant-initial suffixes in (15a,b,d,g) (P-24). The pejorative (15f) already begins with /i/, so no vowel is inserted. Before the diminutive's lengthening occurs, all clusters of /w/ and short /i/ or /e/ between two consonants coalesce into short [o] (P-28), deriving all the correct surface forms.

- (15) a. -shkiinzhig- 'eye(s)' o-shkiinzhigo-**ni** 'his eye(s)'
 b. nabagisag 'plank' ni-nabagisago-**m** 'my plank' (Nichols 2011)
 c. mitig 'tree' mitigo-**og** 'trees (ANIM)'
 d. mitig 'stick' mitigo-**ng** 'stick+LOC'
 e. mitig 'stick' mitigoo-**ns** 'little stick'
 f. mitig 'tree' mitig-**osh** 'no-good tree'
 g. mitig 'tree' niinimo-**ban** 'late tree' (Nichols 2011)
 h. mitig 'tree' mitigo-**on** 'tree+OBV' (Nichols 2011)

Class 4b–c, however, cannot be derived using rule-based phonology. All inflections are identical to (15): the only difference is that phonological rule P-6 does not occur, resulting in direct suffixation, as shown in (16a) and obviative (16b).

- (16) a. amik 'beaver' amikw-**ag** 'beavers (ANIM)'
 b. makwa 'bear' makw-**an** 'bear+OBV'

Rule-based phonology alone cannot account for the differences between Classes 4a and 4b–c without assuming one class has a different kind of /w/ that gets ignored by P-6. This is not impossible; 4a's /w/ could be derived from a former nonmoraic /o/, or the small set of 4b–c nouns could have retained an old inflectional paradigm (as Nichols observes, Class 4b nouns are almost entirely, perplexingly, disyllabic animal names, which suggests a pattern to their inflection). Nonetheless, that the ~30 Class 4b–c nouns ignore a regular phonological rule that otherwise applies generally across the language suggests either an irregular class or incorrect

starting assumptions. For simplicity, we assume the former, but leave the question open for discussion.

Deriving Class 5

Class 5 is characterized by an underlying /y/ following a consonant that gets deleted in the singular (P-31). We demonstrate the inflectional forms in (17). The consonant-initial suffixes have a short /e/ (17e) or /i/ (17a,b,g) inserted (P-23, P-24). Then, the underlying /y/ contracts with the following vowel between consonants to form /ii/ (P-30). This results in the predicted forms below.

- (17) a. -niji- 'hand(s)' o-niji-ini 'his hand(s)'
 b. aki 'land' nind-aki-im 'my land' (Nichols 2011)
 c. asin 'stone' asini-ig 'stones (ANIM)'
 d. asin 'stone' asini-ing 'stone+LOC'
 e. asin 'stone' asini-ins 'little stone'
 f. asin 'stone' asini-ish 'no-good stone'
 g. -niji- 'hand(s)' ni-ninji-iban 'his former hands' (Nichols 2011)
 h. asin 'stone' asini-in 'stone+OBV'

Note how our modification of rule P-30, as detailed in the section titled PHONOLOGICAL RULES, allows for contraction across the suffixes. Nichols (1980) keeps the scope of this rule narrow and only applies it to /y/ and /ya/. However, broadening the rule to any short vowel allows contraction to occur after i-insertion, and additionally accounts for the pejorative. We assume y-contraction occurs after nasal consonants nasalize their preceding long vowels, then delete (P-29), since y-contraction does not occur in Class 1c nouns.

Deriving Class 6

Class 6 consists solely of the irregular aa-augment nouns, which include [aa] in some inflectional forms. By definition, this class is irregular: its inflectional form is lexically determined. However, our assumptions about the suffixes make aa-insertion more predictable. In (18), [aa] is inserted before the person suffixes (18a), the possessive suffix (18b), the locative suffix (18d), and the pejorative suffix (18f). The forms in (18a–d,g) can be explained if we assume that /aa/ is inserted before

a consonant-initial suffix. The forms in (18e–f) do not follow this generalization. One possible explanation is that [aa] was once inserted before consonant-initial suffixes when the diminutive was vowel initial and the pejorative was consonant initial, and the remnants of the system are fossilized in a now-irregular paradigm. Nonetheless, we believe there is no diachronic phonological process that can explain this irregular class; we make no claims about its segmentation.

- (18) a. -nik- 'arm' o-nikaani 'his arm(s)' (Nichols 2011)
 b. mashkimod 'bag' ni-mashkimodaam 'my bag' (Nichols 2011)
 c. mashkimod 'bag' mashkimodan 'bags (INAN)'
 d. mashkimod 'bag' mashkimodaang 'bag+LOC'
 e. mashkimod 'bag' mashkimodens 'little bag'
 f. mashkimod 'bag' mashkimodaash 'no-good bag'
 g. mashkimod 'bag' mashkimodan 'bag+OBV'

Conclusion

In this paper, we distilled the allomorphy in the twelve Ojibwe noun classes (with the exception of two irregular classes) into a predictable system through the examination of three fundamental factors: (1) the underlying form of the suffixal morphemes, (2) the underlying form of the stem, and (3) the general phonological rules of Ojibwe. We assume suffixes take the following forms (those that differ from Nichols (2011) have been bolded): PER /-**naan**/, /-**waa**/, /-**ni**/; POSS /-**m**/; PLANIM /-ag/; PL.INAN /-an/; LOC /-ng/; DIM /-ns/; PEJ /-ish/; PRET /-**ban**/; OBV /an/. Most stems are treated in the same manner as in Nichols (1980, 2011) except for Class 2a (e.g., *anishinaabe*, *ishkode*), which we treat as long-vowel final rather than w final (following Bloomfield 1958; Valentine 2001). We only make minor changes to the general phonological rules proposed by Nichols (1980): y-contraction (P-30) causes /y/ and /yV/ to coalesce to /ii/ between consonants (as opposed to /y/ and /ya/), and a new w-epenthesis rule inserts a /w/ between a long vowel and certain vowel-initial suffixes to resolve vowel hiatus.

Overall, the approach captures the phonological similarities between certain stems without the use of descriptive noun classes. More importantly, it allows the phonological rules proposed by Nichols (1980) to largely function without referencing abstract descriptive classes. Nichols (2011) explicitly rejects the notion

that these noun classes are psychologically real, and we agree with this position; therefore describing their behavior using general rules is directly beneficial to our understanding of how the phonology and morphology of Ojibwe function.

We highlight that two noun classes cannot be accounted for using rule-based phonology: Class 6 and Class 4b–c (we treat Class 4c as a subset of 4b). Class 6 is definitionally irregular; at least the PER, POSS, LOC, and PEJ suffixes are preceded by a long vowel [aa] (called “aa-augment” by Nichols 1980, 2011). Phonology alone cannot explain the addition of a long [aa], so the class must be lexically specified. Class 4b–c is especially unusual because it behaves regularly in most forms; however, its plural and obviative forms do not undergo /wa/ contraction (P-6), which occurs predictably across the rest of the language in both the nominal and verbal paradigms (Nichols 1980). Why a general phonological rule does not apply to a single class of about 30 nouns is unclear (though see discussion in the subsection titled *Deriving Class 4*).

We would like to close by considering a few directions for future work. First, it is important to consider the knock-on effects that the proposed rule modifications and additions might have. The current work focused only on deriving morphophonological allomorphy in the nominal paradigms, but we intend for the rules to apply across the entire language. Second, we hope that the current work can be used to create pedagogical materials for language learners.

For example, learners could be taught to apply and recognize these regular patterns that cut across nominal classes, rather than memorizing the noun class and class patterns of individual nouns. Third, we are currently in the process of developing a technology known as a finite-state transducer (FST) that can automatically inflect nominal stems, as well as parse inflected forms (for related work in Cree, see Snoek et al. 2014). The goal of this work is to create a full morphological parser for Southwestern Ojibwe, which can be used to build tools for language learners such as automatic noun inflectors, and build parsed corpora for researchers and interested community members to conduct studies that probe the different morphosyntactic patterns in the language (e.g., as has been done by Arppe et al. 2020 for Cree).

Appendix 1: Ordered Phonological Rules and Definitions

All rules are copied directly from Nichols (1980) unless otherwise indicated. Changes and new rules proposed in this paper have been **bolded**. In accordance

with the nomenclature in Nichols (1980), we label our new rule **P-36**. Notably, these numbers do not represent rule ordering, but ordering is important to get the right result. Under our analysis, rule P-36 must occur before rule P-8, and rule P-19 must occur before rule P-18.

P-5. Prevowel Vowel Loss. A short vowel is lost before a long vowel.

P-6. WA Contraction. Postconsonantal /w/ and /o/ contract to oo with the /a/ of the peripheral suffixes. This occurs without exception in verbs, but in nouns occurs only after (a) stems ending in /Cw/ where C ≠ k; (b) the noun final /-aakkw/; and (c) stems ending in /V(k)k/ except [irregular kw-final stems].

P-36. W-Epenthesis. [w] is inserted after a long vowel occurring before a vowel-initial suffix or compound.

P-8. Postvocalic Vowel Loss. A short vowel is lost after a long vowel.

P-19. WLengthening. A vowel is lengthened in front of /w/ followed by a nonsyllabic. This does not apply before DUBITATIVE II, before PEJORATIVE in nouns, and, in verbs, before OBIATIVE. Exceptionally the combination /ssi/ + /w/ + /aC/# in independent negatives gives ssiC.

P-18. Special W Loss. /w/ is lost before consonant clusters and fortis consonants if preceded by a vowel (as per Nichols 2011).

P-21. Pre-non-syllabic W Loss. /w/ is lost after a long vowel before a nonsyllabic (except PEJORATIVE).

P-23. E-Epenthesis. Nonpalatalizing i (/E/) is inserted over a morpheme boundary between a nonsyllabic and a consonant-initial inflectional suffix (and certain derivational suffixes). This applies before /w/ in nouns only before /-waa/ 'I-less'.

P-24. I-Epenthesis. Under the same conditions before derivational and stem forming affixes, /i/ is inserted.

P-28. WI Vocalization. /wi/ and /wE/ are vocalized to /o/ between a nonsyllabic and another nonsyllabic or a word boundary.

P-29. Nasalization. A long vowel is nasalized before /ny/. All vowels are nasalized before /n/ followed by a sibilant. In both cases, the /n/ is omitted.

P-30. Y-Contraction. Interconsonantal /ya/ /yV/ and /y/ contract to /ii/.

P-31. Postconsonantal Y Loss. Postconsonantal /y/ is lost.

P-32. Diminutive Lengthening. The vowel in front of the diminutive suffix is lengthened and nasalized. Epenthetic /E/ becomes /e/. Exceptionally the noun final /-kan/ merges with /-nss/ to /-kaanss/.

P-34. Final Postvocalic W Loss. Word-final postvocalic /w/ is lost, but the /w/ of a verb is not affected.

Appendix 2: Summary Table

All rules are from Nichols 1980 unless otherwise indicated. The process of inserting /aa/ in aa-augment forms has been labeled M-7. C represents any consonant allowed in the position under discussion. V indicates any vowel allowed in the discussed position (VV represents a long vowel, and V represents a short vowel). Grey cells indicate that the predicted forms are unattested (either because no data could be found or because the forms do not exist). **Bold** text indicates a change proposed in this paper (to an affix, class, or rule). Empty cells indicate that the suffix is attached directly without phonological change.

TABLE 2. A summary of the phonological rules that derive each of the noun classes in Ojibwe

	C FINAL	VVNY FINAL	Vv FINAL	VVw FINAL	Vw FINAL	Cw FINAL	Cy FINAL	IRREG. kw	IRREG. c
PER -naan, -waa, -ni	P-23	P-23	-	P-21	P-19, P-18	P-24, P-28	P-30	P-24, P-28	M-7
POSS -m	P-24	P-24	-	P-21	P-19, P-18	P-24, P-28	P-30	P-24, P-28	M-7
PL -ag/-an	-	-	P-8	-	-	P-6	P-30	-	-
LOC -ng	P-24	P-24	-	P-21	P-19, P-18	P-24, P-28	P-30	P-24, P-28	M-7
DIM -ns	P-23	P-23	-	P-21	P-19, P-18	P-24, P-28	P-30	P-24, P-28	P-23
PEJ -ish	-	-	P-36	-	-	P-28	P-30	P-28	M-7, P-8
PRET -ban	P-24	P-24	-	P-21	P-24	P-24, P-28	P-30	P-24, P-28	M-7
OBV -an	-	-	P-8	-	-	P-6	P-30	-	-

NOTES

1. We follow the following conventions: examples written in the double vowel orthography, which provides an intuitive broad transcription of the actual surface form as spoken, are in italics; brackets [X] are for the surface form, slashes /X/ are for the underlying form, and angle brackets <X> are for orthographic form. IPA is occasionally used as marked.
2. A similar rule has been proposed for the closely related language Plains Cree, where /w/ is inserted after long vowels in borrowed French and English names (Wolvengrey 2011:175). We take this as converging evidence that supports the general plausibility of the proposed analysis.

REFERENCES

- Arppe, Antti, Katherine Schmirler, Atticus G. Harrigan, and Arok Wolvengrey. 2020. A Morphosyntactically Tagged Corpus for Plains Cree. *Papers of the Forty-Ninth Algonquian Conference*, ed. by Monica Macaulay and Margaret Noodin, pp. 1–16. East Lansing: Michigan State University Press.
- Berko, Jean. 1958. The Child's Learning of English Morphology. *Word* 14(2–3):150–177.
- Bloomfield, Leonard. 1958. *Eastern Ojibwa*, ed. by Charles F. Hockett. Ann Arbor: University of Michigan Press.
- Newell, Heather, and Glyne Piggot. 2014. Interactions at the Syntax–Phonology Interface: Evidence from Ojibwe. *Lingua* 150:332–362. <https://doi.org/10.1016/j.lingua.2014.07.020>.
- Nichols, John D. 1980. Ojibwe Morphology. PhD thesis, Harvard University.
- Nichols, John D. 2011. Concise Grammar of Minnesota Ojibwe. Unpublished manuscript, University of Minnesota-Twin Cities.
- Ojibwe People's Dictionary*. 2021. Department of American Indian Studies, University of Minnesota. <https://ojibwe.lib.umn.edu/>.
- Snoek, Conor, Dorothy Thunder, Kaidi Lôo, Antti Arppe, Jordan Lachler, Sjur Moshagen, and Trond Trosterud. 2014. Modeling the Noun Morphology of Plains Cree. *Proceedings of the 2014 Workshop on the Use of Computational Methods in the Study of Endangered Languages*, ed. by Jeff Good, Julie Hirschberg, and Owen Rambow, pp. 34–42. Baltimore: Association for Computational Linguistics.
- Valentine, J. Randolph. 2001. *Nishnaabemwin Reference Grammar*. Toronto: University of Toronto Press.
- Wolvengrey, Arok E. 2011. Semantic and Pragmatic Functions in Plains Cree Syntax. PhD thesis, Universiteit van Amsterdam.