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The sound roots of Umó^{n}ho^{n}

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Abstract

This paper presents a corpus-based study of lexemes denoting sounds in Umó^{n}ho^{n} (oma), a Siouan language of North America. I take as a starting point a list of sound-denoting verbal roots (in short: "sound roots"), presented as onomatopoeia in a paper by Dorsey in 1892, that form a coherent set based on their semantic features – they denote sounds. I describe their morphological and syntactic features and their form-meaning mappings in order to assess (1) whether these features distinguish them from other verbal roots, and (2) how well they fit the cross-linguistic definition of ideophones proposed by Dingemanse in 2019. I show that several salient morphological and syntactic features are repeatedly attested with sound roots. However, the currently available corpus does not provide evidence that the sound roots form a homogeneous class on the morphological and syntactic level, due to the disparity of features attested from one root to the other. Hence I conclude that these roots cannot be considered ideophones in Dingemanse's sense. Nonetheless, similarities between the sound roots of Umó^{n}ho^{n} and ideophones in other languages can be observed. They can be grammatically integrated, by contrast with onomatopoeia, and their meaning extends from sound to other sensory domains.

Keywords: ideophones; onomatopoeia; Siouan languages; instrumental affixes; consonant gradation; depiction

1. Introduction

1.1 Background

Native languages of North America have heretofore received little attention in studies on ideophones and are not generally described as having such a lexical class (but see Munro 1998; Duncan 2022; de Reuse 2022). Siouan languages, however, have a notable number of lexemes denoting sounds, which is the first category given in implicational hierarchies of the semantic categories covered by ideophones cross-linguistically (Dingemanse 2012; McLean 2021).

This paper deals with sound-denoting roots in Umó^{n}ho^{n}(-Pá^{n}ka),[1] a Siouan language of the Mississippi Valley branch. It identifies and describes a set of SOUND ROOTS and discusses how well they fit the comparative concept of ideophones as formulated by Dingemanse (2019: 16): "member[s] of an open lexical class of marked words that depict sensory imagery". In this paper, I use the term "lexical class" in reference to a distinctive class of lexemes that form a coherent group and a subcategory of a part of speech.[2]

Umó^{n}ho^{n} (Omaha; oma), traditionally spoken by the eponymous tribe, is a critically endangered (almost dormant) language of the Siouan language family, and whose community is located in the current state of Nebraska, United States. It was extensively documented by the Reverend James Owen Dorsey at the end of the 19th century, and by linguists and community-based language and culture centers from the 1970s on. There are currently no Umó^{n}ho^{n}-dominant speakers, but many elderly members of the Umó^{n}ho^{n} Nation retain various degrees of language knowledge from their childhood and youth. A few diachronic changes can be observed between 19th-century Umó^{n}ho^{n} and modern Umó^{n}ho^{n} (cf. Marsault 2021: 150-153), none of which are relevant to the present discussion, to the best of my knowledge. (Note, however, that the total amount of available data is biased towards 19th-century Umó^{n}ho^{n}.)

In the remainder of this introduction, I will present the main typological features of Umó^{n}ho^{n} (Section 1.2) and comment on the type of sources used for my study

[1] The Umó^{n}ho^{n} and the Pá^{n}ka are distinct but related tribes, with the same heritage language. The differences are mainly lexical, but each tribe generally refers to its own language as Umó^{n}ho^{n} or Pá^{n}ka. This work is based on old documentation of both varieties and modern documentation of Umó^{n}ho^{n}.

[2] Dingemanse (2019: 15-16) apparently has a broader understanding of a "lexical class" as "a distinctive stratum of vocabulary", that can cover several parts of speech.

(Section 1.3). In Section 2, I present my data set of sound roots and how I assembled it. In Section 3, I present morphological and syntactic features of the sound roots, and in Section 4 form-meaning mappings. Based on this description, in Section 5, I compare the sound roots in Umó^{n}ho^{n} to ideophones in other languages and to the comparative concept. I conclude in Section 6.

1.2 Main typological features of Umó^{n}ho^{n}

Umó^{n}ho^{n} is a prefixing and head-marking language with a head-final constituent order: the basic word order is verb-final and dependent clauses precede main clauses, as in (1). It has a very rich verbal morphology that reflects areal features of Native North American languages (see Mithun 2015, 2017). In particular, it has applicative prefixes and a series of instrumental prefixes (see Section 3.6) and, despite encoding up to two arguments on the verb, it has no marker for 3rd persons.[3] Person marking follows a split intransitive alignment. Verbs constitute the main part of speech in terms of size, since property words are intransitive stative verbs (adjectival verbs). Many verbs are formed by the combination of a bound root with one or several derivational morphemes, especially the instrumental prefixes that I will introduce in Section 3.1. A few post-verbal morphemes trigger an Ablaut of the final vowel /e/ into /a/. For instance, the bound root *tíde* '(there is) a drumming sound'[4] becomes *tída* before the proximate/plural enclitic *=í* in (2).

(1) (Dorsey 1890: 71.13 / speaker: Hupetho^{n})[5]

Hó^{n}egó^{n}ch^{h}e	*ki*	*wahó^{n}=biamá.*
morning	when	move=PP.REPORT
noun	**conj.**	**verb**

'They removed the camp when it was morning.'

[3] There is only one exception, the marker of 3PL animate objects of transitive verbs. This marker is also one of the few morphemes that follow a nominative-accusative morphology, by contrast with the overall split intransitivity alignment of the language.

[4] Since °*tíde* is a bound root, it is not clear whether it should be glossed as an impersonal verb, like I did here, or as an intransitive verb 'make a drumming sound'.

[5] The segmentation and glosses in all examples are mine (replacing the original word-by-word glosses from some sources), and the free translation is from the primary source whenever one is provided. Note that Dorsey's free translation sometimes differs from the literary meaning of the sentence, in which case I add my own translation.

In sharp contrast with verbs, nouns have no dedicated morphology (except for inalienable possession markers on a restricted set of nouns, mainly kinship terms), but they regularly include verbal derivational morphology due to frequent conversions from verbs. Nouns can also be used predicatively, as in (1) where *hóⁿegóⁿchʰe* 'morning' is used as an impersonal predicate 'to be the morning'.[6]

It seems that almost any lexeme of the language can be used as a predicate without a copula, and conversely verbs are frequently used as referential expressions in headless relative clauses. (This can later be seen in (9) or (55)). Umóⁿhoⁿ has a series of eleven grammatical elements usually called "articles" because they often act as definite determiners after nouns. However, they are also used after verbs as auxiliaries, relativizers and evidential markers (Eschenberg 2005). Example (2) illustrates the use of articles as determiners after nouns and evidential markers after verbs.

(2) (Dorsey 1890: 410.19 / speaker: Óⁿpʰoⁿ-toⁿga)

tóⁿde	*kʰe*	*noⁿ-hóⁿhoⁿ=biamá;*				
ground	the:HORIZ	INS:foot-tremble=PL.REPORT				
noun	**article**	**verb**				
noⁿ-tída=i		*tʰe,*	*hégazhi*	*amá:*	*Guuuu!*	
INS:foot-drumming.sound=PL		EVID	be.many	EVID	SOUND	
verb		**article**	**verb**	**article**	**onom**	

'They made the ground tremble under their feet; they made a drumming noise as they ran in great numbers: *Guuu!*'

For the reasons evoked above, some lexemes are variably translated by nouns or verbs in English (compare the translations of (14), (15) and (16)).

1.3 Umóⁿhoⁿ data sources

This work is almost exclusively based on written resources, namely corpora and dictionary entries collected by Dorsey about 130 years ago (Dorsey 1890, 1891, 1892,

[6] Throughout this paper, I have standardized the spellings from the diverse sources, using the spelling of the Umóⁿhoⁿ Language and Culture Center (ULCC), like other linguists (e.g. Rankin, 2008; Saunsoci & Eschenberg, 2016). The following letters and digraphs diverge from their IPA representation: <'> [ʔ]; <th> [ð]; <zh> [ʒ]; <sh> [ʃ]; <ch> [ʧ]; <j> [ʤ]; <ẋ> [ɣ]; <oⁿ> [õ] and [ã], which are allophones; <iⁿ> [ĩ]. Expressive vowel length is shown by repetition of the vowel.

n.d.) and modern didactic materials (in their written form). In May 2023, I also conducted group elicitation sessions with elderly speakers and semi-speakers. They provided illustrative examples for the words that they were familiar with, examples of which are taken into account in this paper.[7]

As a result, apart from the few examples from my fieldwork, I have neither access to prosodic information nor to information on semantic subtleties beyond the (sometimes very short) definitions provided in the different sources. I have no negative evidence of the morphological and syntactic features of sound roots either.

Therefore, this paper is a philological study on a closed corpus. It investigates the Umó^{n}ho^{n} language as it is described in the existing documentation.

2. Data set

2.1 Dorsey's list of sound-imitating words

The starting point of this study is a publication by Dorsey in 1892 called "Siouan onomatopes". This short paper (8 pages) mainly consists of an enumeration of Umó^{n}ho^{n} roots and lexemes that Dorsey considers to be onomatopoeia, which he defines as "word[s] or root[s] formed to resemble the sound made by the thing signified". Dorsey presents, one by one, sound-imitating roots, generally followed by one or several derived or compounded forms, as in the following excerpt:

> "*Tási* refers to a snapping sound, made by the aid of a rope, cord, or stiff hide; as, *thitási égo^{n}*, to make such a sound by pulling a cord; *batási*, to make a snapping sound by punching against a rope or stiff hide." (Dorsey 1892: 4)

Dorsey starts the definition of many roots with "used to describe the sound …" or "denotes the sound of …", without clearly stating whether or not they are free forms. It seems that many of them are bound roots, since they only appear in texts and

[7] Many of the sound-imitating lexemes documented in Dorsey only came to us as word lists with rather short definitions, and no contextualized examples. This makes them particularly difficult to remember for speakers whose memory of the language is often triggered by the context of use. Additionally, I often didn't know how to pronounce the words accurately, since I did not have recordings of them, and sometimes no indication of stress placement. For these reasons, many sound-denoting lexemes documented in Dorsey could not be reused in elicitation.

dictionaries with some derivational process applied to them (affixation or reduplication). In this paper, I write these roots with an initial ˚.

Dorsey's (1892) data is very diverse overall. In the excerpt above, for instance, he presents the root ˚*tási* and two derived lexemes, *thitási* and *batási*. The first derived form is presented in a collocation, *thitási égo^{n}* 'to make a snapping sound by pulling a cord' (see Section 3.5), while the other is provided alone. Dorsey also provides a few full sentences in his paper (e.g. entries 37 and 110 of Appendix A). Additionally, the roots provided belong to different parts of speech. Finally, Dorsey gives most of the definitions in a non-italicized font, but a few are in italics.

All the data provided in Dorsey (1892) is reproduced in Appendix A, alphabetically ordered by roots.[8] The roots are numbered in bold, from 1 to 53, and followed by any illustrative form that Dorsey added (derived lexeme, corresponding onomatopoeia or extra-linguistic sound imitated, collocation, sentence). Each form associated with a definition or a translation is an entry in Appendix A. Entries are numbered from 1 to 116.

In Dorsey (1892), the majority of the roots are displayed in two tables, ordered by the final syllable, and defined in the text, while a few are only mentioned in the body of the text. Dorsey thereby implicitly makes a distinction between a category of what I call "sound roots" and other sound-imitating lexemes. He also incorporates into his study a few roots which are not sound-imitating, but which he thinks could have been sound-imitating in an earlier stage of the language.

Before proceeding with an analysis of the formal and semantic features of the sound roots in Sections 3 to 5, I will present the roots that I have eliminated from the data set, and explain why, in Section 2.2.

2.2 Roots and lexemes eliminated from the data set

2.2.1 Bound roots that do not refer to sound

Dorsey refers to several roots that he suspects could have originally referred to a sound, but do not any more. He mentions a root ˚*za* attested in the compounded noun *no^{n}bé ugáza* 'phalanges' (with *no^{n}bé* 'hand'), and the root ˚*mo^{n}*, which is found in a couple of verbs related to sharpening a scythe or an ax, and for which "the original reference (…) may have been to the sound made" (Dorsey 1892: 4). The latter root is also found in verbs completely unrelated to sound production, such as *bimó^{n}* 'to knead

[8] Dorsey also provides a few cognates in other Siouan languages. These cognates are not taken into consideration in the present paper.

dough'. Additionally, he mentions the root ˚*dazhe* that creates verbs meaning 'to chafe or blister' and 'to fillip with the fingers', and ˚*duzhe* 'split, cracked' (Dorsey n.d.).[9] These verbs are probably mentioned because they are related to sound-denoting roots through the phenomenon called "consonant gradation" (Section 4.1). Since they are not sound-denoting themselves, I eliminated them from my data set.

Finally, Dorsey mentions the root *záde* which "conveys the idea of branching off or forking", and provides example (3).

(3) (Dorsey 1892: 5 – my glosses)

Hú	*t^{h}e*	***záde***	*ínahi^{n}.*
voice	the:VERT	**fork**	be.really.so

'The voice is really indistinct – that is, the sound scatters instead of going straight to the person addressed.'

Example (3) refers to sound because of the subject *hú* 'voice', not because of *záde* 'branching off'. As a consequence, I also eliminated the root *záde* from the data set.

2.2.2 Names of birds

At the end of his paper, Dorsey provides two bird names, which are referential and stand out from the rest of his data: *hák^{h}ugthe* 'whippoorwill' and *káxe* 'crow'. Cross-linguistically, many bird names are formed by an imitation of the songs or cries produced by the birds in question (Ullmann 1962: 86), and thus show iconicity: "a perceived resemblance between aspects of form and meaning" (Dingemanse 2019: 18). The two bird names do not display any morphological or syntactic particularity compared to other nouns, and they are not further studied.

2.2.3 Iconic verbs

The verbs *héch^{h}i^{n}* 'to sneeze' and *húxpe* 'to cough' are clearly sound-imitative. Except for their iconic nature, however, *héch^{h}i^{n}* and *húxpe* behave like regular verbs and have no morphological or syntactic specificity that would require a special treatment in a grammatical description. They can be inflected for person, as in (4) and (5). Like

[9] Although the action of splitting and cracking generally produces sound, the *meaning* of the root is not the sound, it is the action. This is a major difference with the sound roots analyzed in this paper.

°*dúzhe* ‘split, cracked’ mentioned above, they refer to an action that produces a sound, but their meaning is not restricted to the sound in question.

(4) (Saunsoci & Eschenberg 2016, 180 / speaker: Alice Saunsoci)[10]
Tha-héch^{h}i^{n} *ki,* *í* *t^{h}e* *ágaẓada=ga!*
A2-sneeze when mouth the:VERT cover=IMP.M
‘Cover your mouth when you sneeze!’

(5) (Dorsey n.d., entry *húxpe*, my translation)
hu<á>xpe
<A1SG>cough
‘I cough’

2.2.4 Onomatopoeia

I define onomatopoeia as “the proper sound imitations [of sounds of extra-linguistic reality]” (Körtvélyessy 2020), like English *bang*, where the sound imitation both motivates and defines an onomatopoeia, and which are utterances of their own.[11] Two roots listed in Dorsey (1892) are onomatopoeia: the first one is *k^{h}u* for the sound of a gun, illustrated in (6), and the second is the barking sound *hu-hu-hu* exemplified in Dorsey (1892) (see entry 29 of Appendix A). Note that none of them is written with a stress in Dorsey’s documentation.

(6) (Dorsey 1890: 436.6 / speaker: Páthi^{n}-no^{n}pázhi)
o^{n}g-úthi’aga=í=de *wa-k^{h}ída=i:* ***K^{h}u!*** ***k^{h}u!*** ***k^{h}u!***
A1PL-not.want=PL=as P1PL-shoot=PL **SOUND** **SOUND** **SOUND**
‘When we refused to let them go, they shot at us: *Ku! ku! ku!*’

Syntactically, onomatopoeia share common features with interjections, since they do not enter into syntactic constructions with other parts of speech (Wilkins 1992: 124).

[10] Saunsoci & Eschenberg (2016) spell this verb *héchi*, but I follow Dorsey’s spelling here. They present it with the person prefixes on the left, as seen in (4), but Dorsey (n.d.) presents conjugated forms with person prefixes between the two syllables (A2: *he-thi-ch^{h}i^{n}*), like *hu-á-xpe* in (5). This suggests that, historically, these verbs are morphologically complex.

[11] With this definition restricted to “proper sound imitations”, verbs or nouns derived from onomatopoeia are not considered onomatopoeia any longer. For instance, sound imitation still motivates the derived verbal form *to bang*, but does not define it.

Several onomatopoeia are found in Dorsey's dictionary or texts, but interestingly, *kʰu* 'bang' and *hu-hu-hu* 'woof' are the only ones so far which I have found used as predicates. In (7), *kʰu* is the predicate of an impersonal construction. It takes no subject (either grammatically or conceptually), and as a consequence it is a holophrase. Note that in this instance (and only in this instance), it is stressed. See the discussion in Section 5.2 about the syntactic integration of onomatopoeia.

(7) (Dorsey 1890: 46.12 / speaker: Nudóⁿ-axa)
Kʰú = *biamá.*
SOUND = PP.REPORT
'The sound *ku* was made by shooting, they say.'

2.3 The sound roots

Out of the 53 roots presented in Dorsey's paper, and listed alphabetically in Appendix A, I have eliminated:

- 5 roots that do not refer to sound production
- 2 bird names which have an iconic phonetic form
- 2 verbs which have an iconic phonetic form
- 2 onomatopoeia

This leaves 42 sound-denoting verbal roots, called SOUND ROOTS in short. Like onomatopoeia, sound imitation both motivates their form and defines them, but unlike onomatopoeia they are not attested as utterances on their own. The next two sections discuss a number of features which are often associated with sound roots.

3. Morphological and syntactic features of sound roots

3.1 Generalities

All sound roots are verbal.[12] Some of them are independent (see Section 3.2), but many seem to be bound roots, as they are only attested in texts and dictionaries with some derivation. This seems, for instance, to be the case of the root ˚*táshi*, which is

[12] The definition of *tatáshi* in (8d) could correspond to a noun or a verb. This does not affect the classification of *tatáshi* as a verb, since verbs are easily used referentially, as mentioned in Section 1.2. See example (9).

attested with the most common derivations of sound roots, i.e. addition of an instrumental prefix and reduplication, as shown in (8). It is also derived with a suffix *-é*, which will be described in Section 3.3. Note furthermore that the root *˚tashi* is not even defined by Dorsey, who only refers to the verbs derived from it.

(8) a. Root alone:

˚táshi 'seems to be used in two different ways: [*batáshi* and *gatashi*]' (D92)

b. with instrumental prefixes (non-exhaustive list)

→ ***ga****táshi* 'to make the sound *tshshsh* heard when one strikes a tree with an ax when the sap is flowing' (D92)

→ ***bi****táshi* 'to make a sound with the throat, almost "hawking"' (DD)

c. with *-é*

→ *táshi****é****-xti=o^{n}* 'said of persons, when they make much noise with their spoons, knives, or forks' (DD)

d. with reduplication

→ ***tatáshi*** 'said of the repeated ticking of a clock, or of the sounds made by many marbles' hitting together' [sic] (DD)

The prefixes *ga-* 'by striking' and *bi-* 'by blowing' illustrated in (8) are called "instrumental prefixes", and they will be presented in Section 3.6.[13] All of the sound roots are attested with at least one instrumental prefix, and most are attested with several.

3.2 Syntactic functions of the independent roots

Independent sound roots are always intransitive verbs. They are sometimes used as the main predicate of the clause, as in (9) for the root *za'é* 'to make an uproar (subject plural)' (my translation), and in (10) for the verb *xtházhe* 'to bellow, to scream out'. In (9), the verb is embedded in a relative clause. The plural proximate article *amá* acts as a relativizer, and the relative clause is in apposition to *gá-ama* 'those ones'.

(9) (Dorsey 1890: 587.1 / speaker: George Miller)

"*Ko^{n}há,*	*gá-ama*	***za'é***	*amá*	*eát^{h}o^{n}=i*
grandmother.VOC	DEM-the:PX.PL	**make.uproar**	the:PX.PL	why=PL

[13] Instrumental prefixes should not be confused with the instrumental applicative marker which has no lexical meaning, and which adds an instrument as a verb object.

a,” á = biamá.
Q say = PP.REPORT
‘At last the Orphan said, “Grandmother, why do they make such a noise?”’
Literally: “‘Grandmother, those ones, those that make an uproar, why is it so?” said he, it is said.’

(10) (Dorsey 1890: 103.2 / speaker: Frank La Flesche)
Mo^{n}nó^{n}’u *mo^{n}thí^{n} = biamá,* ***xthazhé*** *shti mo^{n}thí^{n} = biamá.*
paw.the.ground walk = PP.REPORT **bellow** also walk = PP.REPORT
‘The blunt-horned Buffalo-bull kept (…) pawing the ground, and bellowing.’

They can also be used as verb modifiers in verb sequences, as exemplified in (54) for *za’é* ‘to make an uproar’. Verb sequences where the first verb modifies the second one are pervasive in the language. (See Marsault 2021: 140-142 for an introduction to the various types of verb sequences.)[14]

(11) (Dorsey 1890: 288.16 / speaker: Nudó^{n}-axa)
Za’é*-xti* *ó^{n}he = hnó^{n} = biamá.*
make.uproar-INTENS flee = HAB = PP.REPORT
‘They fled without exception, in great confusion.’ (i.e., making an uproar)

Note that by contrast with many bound sound roots, independent sound roots generally have an easily identifiable lexical meaning, and hence they are translated rather than glossed as SOUND.

By contrast with the iconic verbs presented in Section 2.2.3, sound roots are never attested with person prefixes (there is only one exception with *zúde* ‘to whistle’, discussed in Section 5.2). They are only attested with 3rd person subjects, which have no corresponding person prefix on the verb. It is not clear whether the absence of examples with 1st and 2nd person is due to a limitation of the corpus (the underived sound roots attested as verbs are rather scarce compared to the derived lexemes, and most of the texts are legends in the third person), or if it points to a morphosemantic restriction of the sound roots. In his dictionary, Dorsey presents *za’é* as a noun ‘a noise, hum, buzz, bustle,

[14] Although examples (10) and (11) contain serial verb constructions, they are different. Movement verbs such as *mo^{n}thí^{n}* ‘walk’ sometimes have a continuative meaning. Observe the difference of translations.

confusion' (despite its repeated attestations as a verb, as in (9)). The entry of the verb *xtházhe* 'to scream out' includes conjugated forms which are crossed out.

3.3 Derivation with the suffix -é

Several roots are attested with and without a final accented vowel *-é* of uncertain meaning. This suffix is only attested in Dorsey's dictionary (DD) and in one proper name listed in Fletcher & La Flesche (1911), and it is almost always associated with sound roots. As shown in (55), the bound root ˚*táxi* is mentioned in Dorsey (1892) as a bare root, but is only attested with *-é* in his dictionary.

(12) a. ˚*táxi* 'formed from the sound *txxx*' (D92)
b. *táxié* 'the sound made in chopping wood in cold weather' (DD)
'knocking sound' (FLF:151), part of a proper name
c. *táxié t^{h}ígthe* 'to make the sound *taxi* suddenly, in this place.
Applicable to a coyote or wolf when crunching bones.' (DD)

The definitions in (55) suggest that the root ˚*táxi* is the phonotactically correct way to represent an extralinguistic sound resembling *txxx*, but it has no lexical meaning; *táxié* is a lexeme describing the sound (maybe an impersonal verb); and *táxié t^{h}ígthe* refers to an event (used in an intransitive construction).

Example (55) is the only example we have of a lexeme with *-é* in a sentence.

(13) (Dorsey n.d.: entry *táxié* – my glosses and translation)
zho^{n} *gáse=ma* *táxi-**é**-xti=ó^{n}=i*
wood chop=the:OBV.PL SOUND-**e**-INTENS=AUX=PL
Literally: 'those that cut wood produce the sound *táxi*'

In total, six sound roots are attested with the morpheme *-é*, including three which differ only by the point of articulation of their fricative (˚*tasi,* ˚*tashi*, and ˚*taxi*). Examples in (14) through (16) reproduce some of the dictionary entries that include *-é* (in bold).

(14) (Dorsey n.d.: entry *tásié t^{h}ígthe*)
*tási-**é** t^{h}ígthe*
'to make the sound *tasi* suddenly, as in breaking a lariat, in this place'

(15) (Dorsey n.d.: entry *pʰukie tʰígthe*)
*pʰuki-**e** tʰígthe*
'a sudden sound, made by beating a soft robe, etc'

(16) (Dorsey n.d.: entry *túshié*)
*túshi-**é**-xti=o*^{n}
'said of the sounds of many distant reports of a gun,
probable meaning: "they sound very distant"'

The meaning of *-é* is uncertain, apparently even for Dorsey himself (he writes "probable meaning" in (16)). It is not attested in modern documentation. Since it almost always follows sound roots, it could historically originate from the verb *é* 'to say', as suggested by Larson (2022). Note that cross-linguistically, many ideophones or sound-imitating lexemes are used with 'to say' (e.g., contributions in this volume by Authier, Bril, Meyer, Treis, Rose). The only example of *-é* on a non-sound-imitating root is given in (17).

(17) a. *bazhú* 'callous: as any hard place on which the skin has formed by a burn or otherwise' (DD)
'knotty, as wood that cannot be split' (DD)
b. *bázhu**é** tʰígthe* 'a knot or lump rises suddenly' (DD)

As seen above, the lexemes including a final *-é* are always followed by *tʰígthe* 'suddenly' or by *-xti=o*^{n}, of uncertain meaning. Both *tʰígthe* and *-xti=o*^{n} seem to imply an idea of suddenness, or of 'burst[ing] forcefully into experience' (an image suggested by Larson 2022).[15] It should be noted, however, that *tʰígthe* and *-xti=o*^{n} are not triggered by the final *-é*, and can occur in other contexts. (See (20) and (34) for *tʰígthe*).

3.4 Construction with **tʰígthe** *and* **tʰíthe** *'suddenly'*

A significant number of the roots listed in Dorsey (1892) are followed by *tʰígthe* or (in one instance) by *tʰíthe*, as illustrated in (18) and (19), respectively.

[15] Note that in other languages, ideophones sometimes convey suddenness in themselves (this is regularly the case in Thulung, described in Lahaussois this volume; see also Meyer and Quint this volume).

(18) (Dorsey n.d.: entry *bthó^{n}xe t^{h}ígthe*)
bthó^{n}ẋe *t^{h}ígthe*
SOUND suddenly
'to make a sudden crunching sound'[16]

(19) (Dorsey n.d.: entry *xu'é át^{h}iáthai*)
xu'é *át^{h}iátha=i*
SOUND pass.suddenly.PL=PL
'they (i.e. birds) passed with a sudden buzzing or roaring'

T^{h}ígthe and *t^{h}íthe* are compounds of *t^{h}í* 'to arrive here', *gthé* 'to go back there', and *thé* 'to go there', which encode third person plural and proximacy with an initial *a-*, as observed in (19). Their semantics has evolved towards an expression of sudden action, whence my gloss 'suddenly'. *T^{h}ígthe* is defined in Dorsey's dictionary as 'expressive of sudden action; used after other verbs', but it is also attested in texts as 'to become suddenly' (following a noun or a verb expressing a property) and 'to start suddenly' (following a verb of action). *T^{h}íthe* is defined as 'to begin, commence, start suddenly; to come forth, as an infant at birth' in Dorsey's dictionary, but is sometimes glossed 'pass along' or only 'suddenly' in texts. In (19), *t^{h}íthe* retains its original semantics of movement, with an addition of suddenness of action.

Dorsey's dictionary includes at least 42 entries composed of collocations with *t^{h}ígthe* or *t^{h}íthe*, which suggests either that these collocations are frequent enough to deserve being added as a dictionary entry, or that they have a distinctive or expressive meaning. Interestingly, out of the 35 different roots represented in these entries (several entries with *t^{h}ígthe* involve the same root), 16 refer to the emission of a sound – almost half of them –, and 14 belong to the sound roots studied here. Fletcher & La Flesche (1911) also provide four proper names with *t^{h}ígthe* or *t^{h}íthe*, three of which involve sound emission. (The fourth involves movement.)

Three of the sound roots are only attested, in their underived form, in combination with *t^{h}ígthe*. The first one is *bthó^{n}ẋe* 'making a crunching sound', a root generally poorly represented in the corpus. The second one is *tidé* 'the sound heard in walking, striking a board, the ground'. The third one is the root *shkpáp^{h}i* 'splashing, slapping',

[16] Example (18) is an unmarked verb (third person singular obviative), used as a citation form in the lexicon, and therefore translated as an infinitive.

only attested in a barely legible manuscript note, reproduced in (20) (XX and vowels in brackets indicate illegible text). As we see, it is followed by *égo*^{n} and *t*^{h}*ígthe*.

(20) (Dorsey n.d.: entry *thashkáp*^{h}*i*)

shkáp^{h}*i*	*égo*^{n}	*át*^{h}*[ia]gthai?*
SOUND	like	appear.suddenly

'XXX be gone with a splash XX'

This data suggests that *t*^{h}*ígthe* and *t*^{h}*íthe* could act as light verbs in these contexts, which would mean that the preceding roots (*bthó*^{n}*ẋe*, *tidé*, *shkpáp*^{h}*i*) have a limited predicative function. These roots are considered free roots, but more data is needed to confirm that they can be used as verbs on their own.

3.5 Construction with égo^{n}

The lexeme *égo*^{n} is multifunctional and very frequent. Historically, it is composed of the demonstrative marker *é* and the morpheme *-go*^{n}, which has a similative meaning. It is found in many different syntactic constructions, and with slightly different meanings. We can identify at least the following uses:[17]

1. Verb 'to be so', 'to be like' (conjugates with 1st and 2nd patientive)
2. Verb 'it is (somewhat) like it' (always 3rd person, does not conjugate)
3. Conjunction 'as, having', after a dependent clause

The three functions are exemplified in examples (21), (22) and (23), respectively. We see in (22) and (23) that *égo*^{n} does not conjugate. This shows that it behaves differently in different syntactic constructions, hence the need to distinguish the three functions.

(21) (Dorsey 1890: 731.10 / speaker: Mo^{n}ch^{h}ú-No^{n}ba)

Zé<thi>tha=í	*ki,*	*díxe*	***é<thi>go**^{n}**=bázhi***	*ta=í.*
<P2>doctor=PL	if	be.scabby	**<P2>be.so**=NEG.PL	IRR=PL

[17] The different meanings and functions of *égo*^{n} are obviously linked. There are attested diachronic pathways from simile (here, 'to be like') to subordinators (Heine & Kuteva 2002: 273-274; Güldemann 2008: 317ff).

‘If you are vaccinated you will not have the small-pox.’
Literally: ‘If they doctor you, you will not be scabby (=with smallpox).’

(22) (Dorsey 1890: 152.18 / speaker: Nudó^{n}-axa)

To^{n}dé,	*u<thí>nadátho^{n}*	***égo^{n},***	*á=biamá.*
daughther’s.husband	<P2>used.to.heat	**it.is.like**	say=PP.REPORT

‘O daughter’s husband, have you become somewhat accustomed to the heat?’

(23) (Dorsey 1890: 87.14 / speaker: Nudó^{n}-axa)

Hau!	*u<thí>tha=i*	***égo^{n}***	*wi-nó^{n}’o^{n}*	*pí*	*ha,*
ho!	<P2>talk.of=PL	**as**	A1SG:P2-hear	A1SG.come.here	DECL.M

á-biamá.
say=pp.report
‘Well, as you have been reported (=famous), I have been coming to hear you.’

The sound roots are regularly associated with *égo^{n}*, apparently with the second meaning ‘it is (somewhat) like it’. Example (24) shows how the speaker Arlington Saunsoci spontaneously added *égo^{n}* after the reduplicated sound root *zuzúde* ‘whistling sound’ during an elicitation session on sound imitations.

(24) (Fieldwork session May 11, 2023: 5’39-6’03 / speaker: Arlington Saunsoci)
AS: *Zuzúde wa’ó^{n}*. ‘She’s whistling the song.’
JM: And have you ever heard *zuzúde* used alone? without *wa’ó^{n}*? Like just *zuzúde*, or *zuzúda*? Does it sound… natural to you?
AS: If you say, *zuzúd(e)-ego^{n}*, it’s kind… you’re saying: ‘it’s kind of a whistle’

Almost all of the examples with *égo^{n}* ‘it is (somewhat) like it’ involve sound roots derived with instrumental prefixes (more on this in Section 3.6). In a dictionary entry reproduced in (25), Dorsey provides a conjugated form for the phrase *mútaxi égo^{n}*, ‘to make the sound *taxi* (…)’. As can be seen, only the verb *mútaxi* is conjugated, but not *égo^{n}*.

(25) (Dorsey n.d.: entry *mútaxi*, my glosses)
mútaxi égo^{n}
to make the sound *taxi* by firing a gun and letting the hammer fall; to make this sound by shooting and hitting a bone

[A2 form:] *mú-tha-taxi* *ego*^{n}
INS:shoot-A2-SOUND it.is.like

Additionally, Dorsey does not provide any definition for *mútaxi*. Instead, he directly jumps to the sub-entry *mútaxi égo*^{n} in (25), as if *mútaxi*, although identifiable as a lexeme, could not be used without *égo*^{n} 'it is (somewhat) like it'. This is similar to example (24), and also reminiscent of the dictionary entries that include *t*^{h}*ígthe* and *t*^{h}*íthe* 'suddenly', in Section 3.4.

In total, thirteen of the 42 sound roots are attested with a *égo*^{n} 'it is (somewhat) like it', most of the time in combination with an instrumental prefix.

3.6 The instrumental prefixes on the sound roots

Umó^{n}ho^{n} (like other Siouan languages) has a series of prefixes which specify how the action is carried out, and that are usually called "instrumental" in the literature on Native North American languages. Table 1 presents the nine instrumental prefixes of Umó^{n}ho^{n}, and the main meanings for each of them. (See UNL-OLIT 2018:433-63 and Marsault 2021:289-304 for a more detailed description and semantic analysis.)

Instrumental prefixes mostly combine with verbs and bound verbal roots, and they invariably create verbs, which I call "instrumental verbs". As mentioned in Section 3.1, all sound roots are attested in combination with at least one instrumental prefix.

Prefix	**Meanings**
ba-	by pushing
bi-	by pressing; by blowing with the mouth
ga-	by striking; by sudden action of wind; by falling
má-	by cutting; with a blade
mú-	by shooting; with a stream of water or wind; with shooting sensations (like pain)
ná-	by extreme temperature
no^{n}*-*	with the feet; under its own power
tha-	with the mouth
thi-	by pulling; with the hands

Table 1: Main meanings of the instrumental prefixes

Instrumental prefixes generally have a causative function. For instance, the prefixes *thi-* ‘with the hands’ and *ga-* ‘by striking’ have a causative function in (26) and (27), respectively. In each case, they create transitive verbs which are the head of independent clauses.

(26) (Saunsoci & Eschenberg 2016: 140 / speaker: Alice Saunsoci)

Tizhébe	*t^{h}e*	***thi-’áẋa.***
door	the.VERT	**INS:hand-squeak**

‘He squeaked the door (made the door creak).’

(27) (Dorsey 1890: 266.10 / speaker: Te-úko^{n}ha)

tí-ha	***ga-p^{h}úki*** = *biamá.*
tent-skin	**INS:force-SOUND** = PP.REPORT

‘They made the tent skins sound by hitting them.’

Quite often, however, the instrumental verbs derived from sound roots are found in different syntactic constructions. In (28), the main verb of the clause is *uxpátha* ‘to fall’. The sound root *kúge* ‘hollow sound’ (ULCC), derived with *ga-* ‘by falling’, creates the verb *gakúge* which acts as a modifier of *uxpátha* ‘to fall’. Here, the meaning of the prefix *ga-* ‘by falling’ is redundant with the main verb of the clause.

(28) (UNL- OLIT 2018: 562)

Kúge	*tho^{n}*	***ga-kúge***	*uxpátha.*
drum	the:RND	**INS:fall-**SOUND	fall

‘The drum fell with a thump.’

In example (29), the use of the instrumental prefix *tha-* ‘with the mouth’ on the sound root *sathú* ‘to rattle’ is redundant with the same prefix on another verb, and corresponds to an echo construction (an example of “echo phenomena”, often used in the description of associated motion markers; see Guillaume 2009, Jacques 2023). This sentence is provided by Dorsey in lieu of a definition for the verb *thasáthu*. His translation suggests that *thasáthu* is used intransitively.[18]

[18] Primary stress must fall on one of the first two syllables of the word. This is why the stress shifts to the left when the prefix *tha-* ‘with the mouth’ is added to the root *sathú* ‘to rattle’.

(29) (Dorsey n.d.: entry *thasáthu*)

Wat^{h}ó^{n}zi	***tha**-shpí*	***tha**t^{h}á = i*	*ki,*	***tha**-sáthu = i*	*ha*
corn	INS:**mouth-**off	eat = PL	when	INS:**mouth-**SOUND = PL	DECL.M

'to make the sound heard when corn is eaten from the cob'
Literally: 'When they eat corn by biting it off [from the cob], they produce the sound *sathu* with their mouths'

The same can be said of the verb *thixú'e* 'to make the sound *xu'é* by tearing' in (30). Again a sentence is provided instead of a definition in a dictionary entry.

(30) (Dorsey n.d.: entry *thixú'e*)

***Thi**-btháza = i*	*ki,*	*hú*	*t^{h}e*	***thi**-xu'é.*
INS:**hand-**open = PP	if	sound	the	INS:**hand-**SOUND

'If any object is torn, the sound is *thixu'é.*'

We see in (31) another example of *thixú'e* 'to make the sound *xu'é* by tearing' in a narrative. Again, it is used intransitively, following another verb with *thi-* 'with the hands', in a clause that modifies this other verb.

(31) (Dorsey 1890: 259.11 / speaker: Te-úko^{n}ha)

égithe	*te-néx̣e*	*thi^{n}k^{h}é*	***thi**-btháza = biamá,*
at.length	buffalo-bladder	the:OBV.SIT	INS:**hand-**open = PP.REPORT

***thi**-xú'(e)*	*egó^{n} = ma.*
INS:**hand-**SOUND	it.is.like = EVID

'At length the Buffalo-bladder was torn open, making the sound *xu'e.*'[19]

We observe that in (31), the instrumental verb *thixú'e* is followed by *égo^{n}* 'it is (somewhat) like it'. Indeed, many instrumental verbs built on sound roots are followed by *égo^{n}*. Example (25) in Section 3.5 showed that Dorsey sometimes provides dictionary entries for an instrumental verb alone, and then only defines or exemplifies it with a sequence with *égo^{n}*. Example (32), an extract of my fieldwork with current-day speakers, also suggests that some instrumental verbs are mainly or only used with *égo^{n}*.

[19] Dorsey writes *thixú'egó^{n}-ma* as a single word. For the sake of uniformity, I write *égo^{n}* as a separate word in this example.

(32) (Fieldwork session, May 10, 2023 / speakers: Arlington Saunsoci and Dwight Robinson)
JM: Any other word with *tushi*? Like *tutúshi*, or *thitúshi*... No? Only *gatúshi*?
[various people mutter to themselves, trying to remember]
DR: *gatúshi* is the only one that I know.
AS: *thitúsh' égo^{n}*. You say that when you say 'making a popping noise'.

In (33), we see the entry *gap^{h}úki égo^{n}*, created in addition to the entry *gap^{h}úki*. Dorsey provides a sentence which does not include the entry *gap^{h}úki égo^{n}*, but rather describes how its sound is produced (by hitting robes). He then specifies that *gap^{h}úki égo^{n}* "refers to the sound", while the verbs *gako^{n}* or *gako^{n}ko^{n}* "refer to the purpose or effect" (the latter are not cited in Dorsey 1892 and are not built on a sound root). This suggests that *gap^{h}úki égo^{n}* is a more depictive way to refer to the event.

(33) (Dorsey, n.d.: entry *gap^{h}úki égo^{n}*, my glosses)
gap^{h}úki égo^{n}, explained thus by [Wajepa] (1889):
waí^{n} *t'o^{n}* *shó^{n}* *ut^{h}í^{n}*.
robe there.is(?) so(?) hit
This phrase refers to the sound, but *gako^{n}* or *gako^{n}ko^{n}* refer to the purpose or effect.

Finally, example (34) illustrates an instrumental verb followed by *t^{h}íthe*. Unfortunately, there is no example of this verb in a sentence, but it seems again that the instrumental verb still primarily refers to the sound produced. The entry *gakátho^{n}* does not exist.

(34) (Dorsey n.d.: entry *gakátho^{n} t^{h}íthe*)
ga-kátho^{n} *t^{h}íthe*
INS:shake-SOUND suddenly(?)
'to sound or rattle, as an old kettle containing stones, etc., when shaken'

It seems that the semantic and syntactic features of the sound roots are often preserved when these roots are derived with instrumental prefixes. The resulting instrumental verbs refer to sound emission above all (and not to some action resulting in a sound emission), and Dorsey seems to have difficulties to define them (preferring

direct examples to definitions). They are often used as verb modifiers or in adverbial clauses, and we find them in the collocations with *t^{h}ígthe/t^{h}íthe* 'suddenly' or *égo^{n}* 'it is (somewhat) like it'.

In total, I have found evidence of unusual collocations (with *t^{h}ígthe* or *égo^{n}*), valency (intransitive), or semantic value of the prefix (redundancy) in verbs derived from 17 different roots.

4. Form-meaning mappings

This section describes the form-meaning mappings of sound roots. A large number are subject to the phenomenon called "consonant gradation" that will be described in Section 4.1. In Section 4.2, I argue that sound roots are distinct from onomatopoeia, although both are sound-imitative.

4.1 Consonant Gradation

Siouan languages are known for exhibiting a peculiar type of iconicity affecting fricatives, sometimes called "consonant gradation", where different points of articulation (alveolar, post-alveolar, velar) symbolically refer to different grades, e.g. of intensity.[20] This phenomenon is salient enough to be mentioned in Mithun's (1999) survey of Native languages of North America, in a section dedicated to sound symbolism. Its most emblematic example is the three-grade color distinction exemplified in (4) for Umó^{n}ho^{n}.[21]

(35) (Dorsey n.d.)

zí	↔	*zhí*	↔	*x̣í*
'yellow'		'orange-red'(?)		'brown'

This feature probably already existed in Proto-Siouan (Matthews 1970; Rankin et al. 2015), but is no longer productive or is only "semi-productive" (Matthews 1970) in

[20] Consonant gradation in Siouan is completely different from systematic consonant alternations triggered by phonological or morphological contexts as found in other languages such as Finnish. These systems are sometimes also called "consonant gradation" (see Merrill 2018: 29).

[21] The Lakhota cognates *zí* 'yellow', *ží* 'tawny', and *ǧí* 'brown' (API: *zí, ʒí, and ɣí*) are one of the sets most often cited in the literature.

the daughter languages. In Umó^{n}ho^{n}, most examples involve pairs of roots rather than triplets. The points of articulation in contrast vary.

Many sound roots are subject to consonant gradation. The semantic relation between formally related sound roots is often difficult to assess. In a number of cases, the further back the point of articulation is, the more intense or hoarse the imitated sound, as in (36).

(36) a. *zúde* 'a whistling sound' (D92) ↔ *zhúde* 'the expulsion of the breath by a person or animal that is nearly exhausted from running, etc.' (D92)

b. *no^{n}táshi* 'the sound of birds walking on a hard surface with their nails hitting against it: *Ts! Ts! Ts! Ts! Ts*!' (SLW) ↔ *no^{n}táxi* 'refers to the sound of a horse's feet on hard, but not frozen, ground' (D92)

In other instances, the semantic distinction seems to have been neutralized. For instance, Dorsey (n.d.) does not provide any definition for *táshié t^{h}ígthe,* but mentions that it is synonymous with *táxié t^{h}ígthe* 'to make the sound *taxi* suddenly, in this place'. Also, note that in (36b), the definition of *no^{n}tá**sh**i* (with post-alveolar fricative) includes ***ts*** (alveolar) as an imitation of the sound produced by birds.

In still other cases, the semantic relationship between two roots is difficult to assess because each of them has several meanings. The roots *su'é* and *xu'é*, for instance, are described in Dorsey (1892) as referring to a variety of sounds (see Appendix A), and a few more sounds are listed in ULCC (2018). The latter source explicitly states that "*xu'é* is a sound word" and that "*xu'é* is softer than *su'é*" (ULCC, 2018: 36), which is contrary to the examples in (36).

Finally, several sound roots enter into a consonant gradation relationship with other roots which do not always refer to sound. For instance, *bthó^{n}ẋe* 'crunching sound' is linked to *bthó^{n}ze* 'fine, as hair, silk, flour, etc', attested in Dorsey's dictionary (Dorsey n.d.).[22]

Among the 33 sound roots that have a fricative in my data set, 20 are involved in consonant gradation with another root, that is, more than 60%. They combine an imitative type of iconicity (sound imitation) with a relative type of iconicity (consonant gradation) (see Johansson et al. 2020 for a typology of iconicity). Consonant gradation is by no means restricted to sound roots, however. In Marsault

[22] Another example will be mentioned in Section 5.3.

(accepted), I identify 106 roots which enter into consonant gradation relationships, among which we find 23 sound-denoting roots. Thus, sound is involved in only 21% of all roots with consonant gradation, a percentage that makes it nonetheless the main semantic domain represented.

4.2 Sound roots vs. onomatopoeia

In Section 2.2.4 I defined onomatopoeia, and I eliminated two onomatopoeia cited in Dorsey (1892) from my data set. In addition to the fact that, to the best of my knowledge, none of the features described in Sections 3 and 4.1 apply to any onomatopoeia, a few examples show that the same sound can be referred to by a sound root and an onomatopoeia completely different from one another. This is the case in (37), with a rattling sound expressed with the sound root *sathú* and the onomatopoeia *ch^{h}uuuu*.

(37) (Dorsey 1890: 411.1 / speaker: Ó^{n}p^{h}o^{n}-to^{n}ga)

thi-p'ó^{n}de	*gó^{n}*	*thi-**sáthu**=hnó^{n}=biamá:*	***ch^{h}uuuu.***
INS:NEU-shake	as	INS:NEU-**SOUND**=HAB=PL.REPORT	**SOUND**

'Whenever he lifted his tail, he rattled it: *Chuuuu* (whispered).'

Another example can be seen in (2), with the sound root ˚*tíde* and the onomatopoeia *guuuu* for a drumming sound. Finally, note that the fire of a gun can be referred to by the onomatopoeia *k^{h}uuu*, as exemplified in (6), with the sound root *túshi*, exemplified in (16), and with the reduplicated *ch^{h}ich^{h}ízhe*. All of them are listed in Dorsey (1892) and can be found in Appendix A.

5. Sound roots as a lexical class

5.1 Are sound roots ideophones?

Dingemanse (2019: 16) proposes the following cross-linguistic definition of the ideophone, to be used for comparative and typological purposes: "a member of an open lexical class of marked words that depict sensory imagery". One of the main difficulties in analyzing the Umó^{n}ho^{n} data is to assess how "marked" sound roots are, compared to the rest of the lexicon. Are they salient enough to justify being identified

as a distinct lexical class within the class of verbal roots? In Section 5.1.1, I review the features described in Sections 3 and 4 and discuss the markedness of sound roots. Then in Section 5.1.2, I turn back to Dingemanse's definition and discuss how well the sound roots correspond to it.

5.1.1 The markedness of sound roots

In Section 3.3 through Section 3.6, I identified four morphological and syntactic features which mark some sound roots as distinct from the rest of the lexicon, and in Section 4.1, I presented consonant gradation as another possible marked feature. These features are numbered from 1 to 5 in the list below. We see that the markedness of consonant gradation is weak, due to the high number of roots involved in consonant gradation which are not sound roots.

1. morphological construction involving the suffix *-é* (see Section 3.3)
    - roots involved: 6 sound roots / 1 other root
2. collocation with *t^{h}ígthe* '(to become) suddenly' or *t^{h}íthe* '(to become/pass) suddenly' (see Section 3.4)
    - roots involved: 13 sound roots / 2 sound-denoting roots not mentioned in Dorsey 1892 / 20 other roots
3. collocation with *égo^{n}* 'it is (somewhat) like it' (see Section 3.5)
    - roots involved: 13 sound roots / no available figure for other roots
4. morphosyntactic construction where the instrumental prefixes loose their causative function (see Section 3.6)
    - roots involved: 17 sound roots / no available figure for other roots
5. consonant gradation
    - roots involved: 20 sound roots / 3 sound-denoting roots not mentioned in Dorsey (1892) / 83 other roots

The features attested for each sound root are listed in the table in Appendix B. This table shows that the roots differ widely in the number of features they are attested with. Nine roots are attested with 3 or 4 of the morphological and syntactic features, barring consonant gradation. By contrast, twenty roots are found with none of these features.

In Sections 2.3 and 3.1, I defined sound roots as verbal roots which refer to sounds, can be derived with at least one instrumental prefix, and are not attested with person prefixes. This is a rather broad definition, in which the semantics of the root is the only criterion that identifies the sound roots among the numerous verbal roots that combine with instrumental prefixes.

The morphological and syntactic features described in Sections 3.3-3.6 only concern about half of the sound roots, and to various degrees. Thus, there is a certain degree of morphological and syntactic markedness, but the number of roots to be considered as marked varies depending on which features or combination of features are considered relevant. It should also be noted that there is a great disparity in the number of tokens attested for each root. Among the twenty roots which have none of the morphological or syntactic features above, twelve are never attested in narratives nor in example sentences.[23] This makes it almost impossible to know if, for instance, the instrumental prefixes have a causative function or not (dictionary definitions not being specific enough). It also reduces the possibility to find them used in special collocations. A few of them, like *˚túpʰi* 'pattering sound', are not even attested in Dorsey's dictionary, so its mention in Dorsey 1892 is the only attestation in all the available documentation. It is possible that narratives and letters, the two text types recorded by Dorsey, are not ideal to illustrate sound roots, compared to interactions. The modern didactic materials possibly miss sound roots, too. They are often built on translations from English to Umóⁿhoⁿ, and the non-prevalence of sound-denoting lexemes in English may be an obstacle to their documentation and transmission in a context of language shift.

5.1.2 Comparison to Dingemanse's definition of ideophones

Dingemanse's definition of ideophones is made up of five criteria: (a) open class membership; (b) conventionalization as words; (c) phonological, morphological or syntactic markedness;[24] (d) depictive value; (e) meaning in the domain of sensory imagery. I will discuss them one by one below.

[23] The twelve roots that appear in no narrative nor text example, either alone or in a derived form, are: *˚chʰáki*, *˚dáze*, *˚k'éxe*, *˚s'ú*, *˚shathú*, *˚shka*, *˚shtáki*, *˚skápʰi*, *˚túpʰi*, *˚xáthoⁿ*, *xthóⁿzhe*, and *˚zíde*.

[24] Dingemanse (2019:15) writes "ideophones are MARKED, i.e. they have structural properties that make them stand out from other words", without specifying what he means by "structural properties". I interpret it to broadly means any kind of phonological, morphological, or syntactic marking.

(a) open class membership

This is a feature difficult to study in the current state of documentation of the language. I have identified 42 sound roots in the data presented in Dorsey's paper, although this number decreases if we only take into account those that have marked morphological or syntactic features. This makes it a rather small class, but attested cases of polysemy, semantic shifts and interpersonal variation attested suggests that it is an open class (see Sections 4.1, 5.3, and comment on the root *k'úshi* in Appendix B).

(b) conventionalization as words

Sound roots are conventional items. They respect Umó^{n}ho^{n} phonology and phonotactics (by contrast with imitations of extra-linguistic sounds, like *txxx* in (55)), and they have meaning, as we have seen in dictionary definitions. The difficulty to gloss many of them is due to the absence of equivalent terms in English. However, many of them are not words, in the sense that they are bound roots.

(c) phonological, morphological or syntactic markedness

The markedness of the sound roots is discussed in Section 5.1.1. A core of nine to 22 roots are morphologically and/or syntactically marked, while the others are not.

(d) depictive value

The sound roots are not completely depictive, since pure depiction can only apply to units which are not grammatically integrated (see Section 5.2). The punctuation and transcription used in the written sources do not suggest any prosodic foregrounding or expressive lengthening of vowels in the original oral form, by contrast with onomatopoeia, for instance. But like in onomatopoeia, sound imitation defines sound roots, which makes them partly depictive.

(e) sensory imagery

As expressions of sounds, the sound roots come under the semantic domain of sensory imagery.

As a summary, the sound roots form a set of conventional lexical items, possibly open to new members, whose meaning relates to the sensory imagery, and whose sound-denoting nature makes them more depictive than other verbal roots. They do not fit Dingemanse's comparative concept of ideophones, however. They are not

systematically marked, and they are never as depictive and prosodically foregrounded as onomatopoeia are.

Sound roots can be considered one of the ideophone-like phenomena whose study informs us about ideophone systems cross-linguistically, by exploring their boundaries. Sound roots show dynamics similar to ideophones. Indeed, the continuum of syntactic integration and the semantic extension towards other sensory domains is attested for sound roots as it is for ideophones, as I will show in Sections 5.2 and 5.3, respectively.

5.2 A continuum of grammatical integration

Studies show that ideophones tend to gradually lose their depictive force as they become more integrated into the grammar (Dingemanse & Akita, 2016; Dingemanse, 2017). This also applies to Umó^{n}ho^{n} onomatopoeia and sound roots, and can be represented as a continuum.

Table 2 illustrates how eight different roots, in different collocations and with different derivations, extend from completely depictive on the left, to completely descriptive on the right. At one extreme of this continuum are onomatopoeia, which are depictive and never syntactically integrated. (They are featured in dark gray cells.) At the other extreme are nouns or verbs whose meaning is not sound-denoting, although they are derived from sound roots. (They are featured in light gray cells.) The examples in between include sound roots in diverse morphological and syntactic constructions, as long as they preserve their sound-denoting meaning. The medium gray cells also include verbs ‘to bark’ derived from the onomatopoeia *hu-hu-hu* ‘woof’.

We observe that the examples broadly extend on a diagonal from the top left (depictive) to the bottom right (descriptive). The first one, *xwiii* ‘sounds of tree falling’, is a typical example of an onomatopoeia. It appears only once in Dorsey’s published texts, as a purely depictive item. The onomatopoeia *k^{h}u* ‘bang’ on the second line is also used predicatively, as shown in (7). As an impersonal predicate, it remains relatively free, since it is not linked to a subject or an object.

The onomatopoeia *hu-hu-hu* and lexemes derived from it extend on the third line. To the best of my knowledge, it is the only onomatopoeia that is converted into verbs and nouns. It is a verb modifier in (38), and a verb on its own in (39).

(38) (Dorsey, n.d.: entry *hu í*)[25]

Hú	*shi*	*a?*	*K^{h}e!*	*í=ga*
bark	A2.come.here	Q	well	come.here=IMP.M

'Are you coming barking? Well! Be coming! (I will hit you)'

By contrast with the onomatopoeia *k^{h}u* 'bang' used predicatively in (7), the verb *hú* 'to bark' below is intransitive. It is semantically and syntactically linked to the subject 'the wolf'.

(39) (ULCC, 2018: 10 / speakers: Marcella Woodhull Cayou & Donna Morris Parker)

Shó^{n}to^{n}ga	*ak^{h}a*	*hó^{n}=no^{n}-di*	***hú***	*gthí^{n}=no^{n}=biama.*
wolf	the:PX.SG	night=HAB-LOC	**howl**	sit=HAB=PP.REPORT

'The wolf howls at night, they say.'

Finally, *hú* is also a noun 'voice', 'sound', in which case it becomes purely descriptive and referential.[26]

The remaining lines of Table 2 illustrate how five sound roots are more or less grammatically integrated. As previously mentioned, these roots are never attested as onomatopoeia, and they are never as depictive as onomatopoeia are.[27]

The examples on each line are roughly organized from the least to the most grammatically integrated. I consider that the collocations with *égo^{n}* and with *t^{h}ígthe* feature the same degree of grammatical integration, which is relatively low. Verbs are more integrated, and I consider that their grammatical integration increases at the same time as their valency, because they are linked to more arguments.

In Section 5.1.1, I analyzed the sound roots markedness by looking at the morphological and syntactic constructions each root is attested in. Although this is a necessary step in the identification of sounds roots as a lexical class, it sometimes brings contradictory results. Dingemanse (2017) documents how the same Siwu

[25] Note that the sequence *hu í* 'to come barking' has its own entry in Dorsey's dictionary. The movement verb *í* 'to come here' has an irregular conjugation.

[26] Headman & O'Neil (2019) indicate a difference of vowel length between the noun and the verb in Pá^{n}ka: *hú* 'voice' vs. *húu* 'to howl'.

[27] The sound root ˚*táxi* imitates the sound *txxx* or the sound *t'x t'x hyui*, according to Dorsey (1892), but it is not clear whether these forms are actually onomatopoeia or not (considering onomatopoeia as conventional items, and not improvised imitations of extra-linguistic sounds). Even if they were, *txxx*, *t'x t'x hyui*, and ˚*táxi* cannot be considered the same root.

ideophones can be used as "pure", depictive ideophones, or as grammaticalized (and de-ideophonized) ones, following Dwyer & Moshi's (2003) distinction. The same variation of expressiveness can be observed in Umó^{n}ho^{n}. Beyond the various degrees of grammatical integration where the sound roots are still sound-denoting, illustrated in the medium gray cells of Table 2, we observe categorial changes when the root loses its sound-denoting meaning.

Dorsey (1892) presents the root *zúde* as 'denot[ing] a whistling sound, such as a man makes'. Then, he presents the phrase *zuzúde wa'o^{n}* for 'to whistle' (with the reduplicated root *zuzúde* 'whistling sound' used as the modifier of the verb *wa'ó^{n}* 'to sing'), and the verb *gazúzude* 'to roar or whistle often, as the wind does'.

Dorsey's dictionary also contains one entry for *zud(e)-égo^{n}*, 'with a whirr (of the wings)'. From these examples, we can classify *zúde* 'whistling sound' as a sound root, because the sound imitation constitutes its meaning, it can be derived with an instrumental prefix, it is used as a verb modifier and it is attested with *égo^{n}* 'it is (somewhat) like it'.

However, *zúde* is also a verb 'to whistle' in several dictionaries (DD, ST, SLW). In this case, it can take person prefixes and primarily refer to the action of whistling. It can be used in non-declarative-affirmative sentences, as in (40).

(40) (UNL-OLIT 2018: 527)

Tha-zúde	*u<thá>kihi*	*a?*
A2-whistle	<A2>be.able	Q

'Can you whistle?'

The most efficient way to account for this categorization issue is to assume that *zudé* can be used either as a sound root with the usual associated features, or as an iconic verb integrated into the grammar, like *héch^{h}i^{n}* 'to sneeze' presented in Section 2.2.3. The difference between *zudé* 'to whistle' and *héch^{h}i^{n}* 'to sneeze' is that the first is converted from a sound root.

5.3 Semantic extensions

Among the numerous derivations of sound roots with instrumental prefixes, there are a few examples of semantic extensions from sound to visual effects, textures, or

movements. According to Dorsey (1892), the root ˚*dáze* refers to the sound of thunder. But *nádadaze* is defined as ‘to send out light in streamers or fan-like rays’ in Dorsey’s dictionary, ‘to send out sparks’ in his texts, and ‘to sparkle’ in Saunsoci & Eschenberg (2016). The latter specify that “[this verb] refers mostly to jewelry”, as illustrated in (41).

(41) (Saunsoci & Eschenberg 2016: 181 / speaker: Alice Saunsoci)
Wanó^{n}pi’i *k^{h}e* ***ná-dadaza.***
necklace the:HORIZ **INS:temp-SOUND.REDUPL**
‘The necklace sparkled.’

A similar phenomenon occurs with the bound root ˚*p^{h}úki* ‘popping sound’ combined with the derivational prefix *ná-* ‘by extreme temperature’. The verb *náp^{h}uki* is defined as ‘to be made soft and light by the action of yeast, as bread’ (Dorsey n.d.). While this verb originally probably referred to the sound of rising dough, Dorsey makes reference to the resulting texture, and not the sound heard in the process.

Dorsey (1892) introduces the root ˚*shtáki* for ‘flapping or slapping sound, made in mud or some other soft object’. He also documents in his dictionary the root ˚*stáki* which means ‘flying off, as drops of water flung, or as a chip of wood that is hit with an ax’.[28] This could correspond to a semantic extension from sound to movement, along with a shift in the consonant grade.

Semantic extensions from sound to other sensory perceptions (such as movement, visual patterns, and textures) are well described for ideophone systems (see in particular McLean 2021).

6. Conclusion

This paper studies the numerous sound-denoting words of the Umó^{n}ho^{n} language, focusing in particular on one lexical class that I call “sound root”, in order to determine its relation to the cross-linguistic concept of ideophones.

[28] Dorsey writes it with an aspirated /k^{h}/, but Rankin (1974) notes that Dorsey does not record aspiration consistently: the plosives that he writes as non-aspirated are never aspirated, while the plosives he writes as aspirated can be aspirated or non-aspirated.

Root	Completely depictive	- Grammatical integration +			Completely descriptive
xwí	**onomatopoeia** *xwiii* 'sounds of tree falling' (DD, DT)				
k^{h}uuu	**onomatopoeia** *k^{h}uuu*, *k^{h}u* 'bang' (see 6)	**impersonal predicate** *k^{h}ú* 'there is a *ku* sound made by shooting' (see 7)			
hu	**onomatopoeia** *hu-hu-hu* 'barking sound' (D92)	**verb modifier** *hu, úhuhu* 'barking' (see 38)	**intransitive verb** *hu, úhuhu* 'to bark' (see 39)	**transitive verb** *úhuhu* 'to bark at him/her' (DD, RT)	**noun** *hú* 'voice', 'sound' (DD, DT, RT, ULCC)
˚táxi		**used with *égo^{n}*** *mutáxi égo^{n}* 'to make the sound heard by firing a gun (...)' (see 25)	**verb with *t^{h}ígthe*** *thatáxit^{h}igthe* 'crunching of bones' (proper name, FLF)	**intransitive verb** *no^{n}tátaxi* 'to make the sound *taxi* at every step' (DT)	**transitive verb** *gatáxi* 'to make it give a tapping sound by hitting it or throwing it' (DT)
bthó^{n}xe		**verb(?) with *t^{h}ígthe*** *bthó^{n}xe t^{h}ígthe* 'to make a sudden crunching sound' (DD)	**intransitive verb (inanimate subject)** *bthó^{n}btho^{n}xe* 'to snap, as ice when forming' (DD)	**intransitive (?) verb (animate subject)** *thabthó^{n}xe* 'to make a crunching sound once by gnawing' (DD)	**transitive verb** *babthó^{n}xe* 'to make ice, etc., give a crunching sound, by pushing or punching at it' (DD)
sathú		**verb modifier / intr. verb** *sathú* 'rattling/ to rattle' (DT)	**intransitive verb** *thasáthu* 'to make the sound *sathú* by eating' (see 29)	**labile verb** *thisáthu* 'to rattle (it)' (see 37)	**noun** *sathú* 'rattlesnake' (FLF, ST, SLW)
zúde		**used with *égo^{n}*** *zudégo^{n}* 'with a whirr (of the wings)' (DD)	**verb modifier** *zuzúde wa'ó^{n}* 'to whistle, as a man does' (DD)	**intransitive verb** *bizúde* 'to wheeze, as when the nasal passages are obstructed' (DD)	
			intransitive verb *zúde* 'to whistle' (see 40)	**transitive verb** *zuzúde* 'to deceive a person in sport by averting the head after whistling to attract his attention' (DD)	
˚ch^{h}ízhe			**intransitive verb** *gach^{h}ízhe* 'to fall with a crash' (FLF)	**transitive verb** *bach^{h}ízhe* 'to make a single cracking sound by pushing against a twig or small branch, which is broken by the act' (D92)	

Table 2: Continuum from less to more grammatically integrated sound-denoting root

I have defined sound roots on syntactic and semantic grounds: they are verbal roots that can combine with instrumental prefixes and whose meaning refers to sound. In Sections 3.3 through 3.6, I presented some morphological and syntactic features commonly attested with sound roots, setting them aside from the rest of the lexicon. However, these features are not attested with all sound roots, a fact possibly explained by the impoverished data.

In the current state of documentation, sound roots do not fit Dingemanse's (2019) comparative concept of ideophones, because they are not necessarily words (many are bound roots), they are never only depictive, and they are not systematically characterized by the features described in Sections 3.3–3.6. However, they show a resemblance to ideophones in other languages. In Section 5.3, I showed that semantic extensions are attested in Umó^{n}ho^{n} from sound to movement or texture. I also showed that the sound roots show different degrees of grammatical integration.

In Section 5.2, I showed how sound roots extend on a continuum from mostly depictive lexemes to completely descriptive lexemes. Onomatopoeia and sound roots are lexical classes that cover distinct areas in this continuum. At one extreme we find onomatopoeia: they are never syntactically integrated, and they do not undergo derivation to other parts of speech. By contrast, sound roots are never fully depictive, but by being sound-denoting, they retain some depictive force. They are attested in an array of morphological and syntactic environments that can broadly be ordered from less to more grammatically integrated.

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Abbreviations

1 = 1st person
2 = 2nd person
3 = 3rd person
A = agentive person marker
AUX = auxiliary
conj. = conjunction
D92 = Dorsey 1892
DD = Dorsey (no date)
DECL = declarative
DEM = demonstrative
DT = Dorsey (1890, 1891)
EVID = evidential marker
FLF = Fletcher & La Flesche (1911)
HAB = habitual marker
HORIZ = horizontal
IMP = imperative
INS = instrumental prefix
INTENS = intensifier
M = masculine
NEU = neutral (semantically bleached)
OBV = obviative
onom = onomatopoeia
P = patientive person marker
PL = plural
PP = proximate/plural
PX = proximate
Q = question marker
REDUPL = reduplication
REFL = reflexive
REPORT = reportative (subtype of evidential marker)
RND = round
RT = Rudin et al. (1989-92)
SE = Saunsoci & Eschenberg (2016)
SG = singular
SIT = sitting
SLW = Sanchez, Larson & Walker (in progress)
SOUND = sound imitation
ST = Stabler & Swetland (1977, 1991)
temp = temperature
ULCC = ULCC (2018)
UNL = UNL-OLIT (2018)
VERT = vertical
VOC = vocative
˚ indicates a bound root

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Appendix A

The following table reproduces all the Umó^{n}ho^{n} material provided in Dorsey (1892), ordered alphabetically by roots (see Section 1.2). The definitions are unaltered from Dorsey, italics are preserved whenever Dorsey uses them, and the "etc." following some examples are also quotes from the original.

The first column numbers the roots from 1 to 53, in bold. The second column numbers the entries in gray. Entries are roots, lexemes or examples associated with a definition or translation. A few roots have no definition, in which case Dorsey directly provides derived forms, like the root n°4 *ch^{h}ízhe*. Since they have no definition nor translations, they are not numbered as entries, but they are numbered as roots.

The third column lists the roots, lexemes, or illustrative examples. The roots are in bold. Stress marks are reproduced as indicated by Dorsey (sometimes there is no stress).

The fourth column lists the definition or translation of each root, lexeme, or example. Italics are used wherever Dorsey uses them. Additions to the original occur in square brackets.

The roots and their derived forms that are excluded from the present study are in grayed cells (see Section 2.2).

		Root lexeme; example	**Definition**
1	1	***'áx̣e***	used to describe the sounds of filing, grating, gnawing, or scratching on metal, bone, hard wood, etc.
	2	*no^{n}'áx̣e*	the sound made by a horse when walking on frozen grounds
2	3	***bthó^{n}x̣e***	crunching sound, such as is heard when one eats a crust of bread or when a horse eats oats or corn, a dog gnaws a bone and crushes it, or as when one crushes through ice or snow
3	4	***ch^{h}áki***	[the sound heard in *gach^{h}áki*]
	5	*gach^{h}áki*	to make the sound heard in clapping the palms of the hands together
4		***ch^{h}ízhe***	—
	6	*ch^{h}ich^{h}ízhe*	denotes the frequent crackling or breaking of twigs and small branches, or the frequent discharge of fire-arms

		Root lexeme; example	Definition
	7	*bach^{h}ízhe*	1. to make a single cracking sound by pushing against a twig or small branch, which is broken by the act 2. to push ahead, as through a thicket
	8	*ákipach^{h}ízhe*	to persevere in a certain course of conduct, despite all obstacles, regardless of the consequences
5		***dáẋe***	—
	9	*no^{n}dáẋe*	refer[s] to the sound of a horse's feet on hard, but not frozen, ground
	10	*thidáẋe*	refers to one of the sounds of thunder, *ẋẋẋ*, whence we have the personal name *Wathídaẋe*
	11	*Wathídaẋe*	Thunder being makes the sound *ẊẊẊ* ! (proper name)
	12	*hú t^{h}e dáẋe*	the voice is hoarse
6		***dáze***	–
	13	*thidáze*	refers to the sound of the thunder, *zzz*, whence the personal name, *Wathídaze*
	14	*Wathídaze*	Thunder being makes the sound *zzz*!
7	15	***dázhe***	all verbs in dazhe except one, *mudazhe* (…), refer to chafing or blistering the hands or feet
	16	*mudazhe*	*to fillip with the fingers*
8		***dúẋe***	— ("*Dúẋe* has several derivatives")
	17	*thadúẋe*	to make the sound heard when a hazelnut is cracked between the teeth
	18	*thidúẋe*	to make the sound heard when a stick is broken in the hands
9		***dúzhe***	—
	19	*thidúzhe*	to split or crack a board by boring; to crack an egg by handling
10	20	***gíze***	the creaking of new shoes and the sound of fiddle-strings (*Gi-gi-gi*)
	21	*gi-gi-gi*	the creaking of new shoes and the sound of fiddle-strings
	22	*bagíze*	to play the fiddle (i.e., make it creak by pushing the bow)
	23	*no^{n}gíze*	to make (shoes) creak in walking
	24	*thagíze*	to gnash the teeth
11	25	***hák^{h}ugthe***	whippoorwill

		Root lexeme; example	Definition
	26	*hák^{h}ukthe! hák^{h}ukthe! azhó^{n}.*	The Ponka children give the cry of the whippoorwill as follows: *hák^{h}ukthe! hák^{h}ukthe! azhó^{n}.*
12	27	***héch^{h}i^{n}***	*to sneeze*
13	28	***hu***	*to bark as a dog or wolf* is explained by the Omaha description of a barking sound: *hu-hu-hu*!
	29	*hu-hu-hu!*	barking sound
14	30	***húxpe***	*to cough*
15	31	***k'áẋe***	used to describe the sounds of filing, grating, gnawing, or scratching on metal, bone, hard wood, etc.
	32	*thak'áẋe*	mark[s] the sound made by rats when gnawing
16	33	***k'éẋe***	used to describe the sounds of filing, grating, gnawing, or scratching on metal, bone, hard wood, etc.
	34	*thak'éẋe*	mark[s] the sound made by rats when gnawing
17	35	***k'ushi***	denotes a gulping sound
	36	*thak'úshi*	to make noise by drinking
	37	*thak'úshi-xti nazhí^{n}*	said of the noise made in drinking water, whether by a horse or a person [*-xti*: intensifier; *nazhí^{n}*: to stand]
18	38	***kámo^{n}***	refers to the ringing of a bell, etc.
	39	*thikámo^{n}*	to ring a bell by pulling a rope
	40	*gakámo^{n}*	to strike, as a clock does
19	41	***kátho^{n}***	denotes the sound made in pushing against, or pulling from, a door, plank, or hard buffalo hide
	42	*bakátho^{n}*	denoting the action by pushing
	43	*thikátho^{n}*	… by pulling
	44	*gakátho^{n}*	… by hitting
		etc.	
20	45	***káẋe***	a crow

		Root lexeme; example	Definition
21	46	***k^{h}uuu***[29]	describes the report of a gun
22		***ku***	—
	47	*gakú*	*to beat a drum*
23	48	***kúge***	another drumming sound [difficult to distinguish from *tíde*]
24		***-mo^{n}***	—
	49	*bamó^{n}*	to use a file, sharpen a scythe by pushing (the original reference (...) may have been to the sound made)
	50	*thimó^{n}*	to sharpen an ax on a grindstone (the original reference (...) may have been to the sound made)
	51	*bimó^{n}*	to knead dough
25	52	***p^{h}úki***	a popping sound, as heard in drawing a cork from a bottle, or a deadened sound, a sort of thud, as in hitting flesh, garments, or other soft objects
	53	*gap^{h}úkitho^{n} gáxe*	to make the sound heard when one lets a book fall to the floor or ground
26	54	***s'u***	resembles the sound heard in planing (*s! s! s!*)
	55	*bas'ú*	*to plane*
	56	*this'ú*	*to use a drawing knife*
27	57	***sáp^{h}i***	describes such a cracking or smacking sound as is made by a whip-lash
	58	*gasáp^{h}i*	to use a whip
	59	*wégasáp^{h}i*	a whip
	60	*gasáp^{h}itho^{n} gáxe*	to make the sound heard when one lets a book fall to the floor or ground
28	61	***sathú***	used in speaking of the rattling of corn in a granary or on a pile out of doors, as well as of the rattling of the *wes'a sathu* or rattle snake
	62	*wes'a sathu*	rattle snake
29	63	***shathú***	conveys two ideas, [1.] a swishing sound, made in water ; [2.] the sound made by the hitting, dragging, etc., of a chain.

[29] This root is written *k*<*u*+ in Dorsey (1892). The sign + refers to expressive lengthening (written with a triplication of the vowel in this paper), but Dorsey does not specify what '<' means, and this character is not found in his other publications. It is rendered as an aspirated /k^{h}/ here, based on the various attested examples of the onomatopoeia *k^{h}uuu* in texts.

		Root lexeme; example	Definition
30		***shka***	–
	64	*múshkashka*	to gargle the throat
31		***shkáp^{h}i***	–
	65	*gashkáp^{h}i*	to make the sound heard in slapping the cheek of the back of the hand
32	66	***shtáki***	describe[s] one (...) flapping or slapping sound, made in mud or some other soft object
	67	*shtashtáki*	describe[s] [more than one] flapping or slapping sounds, made in mud or some other soft object
33	68	***skáp^{h}i***	[the sound heard in *gaskáp^{h}i*]
	69	*gaskáp^{h}i*	to make the sound heard in clapping the palms of the hands together
34	70	***sú'e***	applied to two sounds: (1.) *sss*, the sound of ice breaking up and floating off, or that of a steady rain; (2.) *sk! sk! sk!* the swishing sound made in walking through grass
35	71	***támo^{n}***	refers to the ringing of a bell, etc.
	72	*thitámo^{n}*	to ring a bell by pulling a rope
36	73	***táshi***	seems to be used in two ways [see derived forms]
	74	*batáshi*	to make the sound heard when one taps on a table with the end of a pencil
	75	*gatáshi*	to make the sound *tshshsh* heard when one strikes a tree with an ax when the sap is flowing
37	76	***tási***	refers to a snapping sound, made by the aid of a rope, cord, or stiff hide
	77	*thitási égo^{n}*	to make such a sound by pulling a cord
	78	*batási*	to make a snapping sound by punching against a rope or stiff hide
38	79	***táxi***	is formed from the sound *txxx*
	80	*gatáxi*	to make the sound heard when a tree is struck with an ax in cold weather
	81	*thitáxi égo^{n}*	describes a sound of thunder, *t'kh-t'kh-hyuuu!*
	82	*t'kh-t'kh-hyuuu!*	a sound of thunder
	83	*batáxi*	is used of the sound heard when one pushes suddenly against a bone

		Root lexeme; example	Definition
	84	*no^{n}táxi*	refers to the sound of a horse's feet on hard, but not frozen, ground
39	85	***tíde***	refer[s] to a hollow or drumming sound on the floor, the ground, or a door (difficult to distinguish from *kúge*)
	86	*no^{n}títide*	[make a pattering sound while walking]
40	87	***túp^{h}i***	marks a pattering sound, as in *no^{n}túpup^{h}i*
	88	*no^{n}túpup^{h}i*	[to make a pattering sound while walking]
41	89	***túshi***	describes the crackling of twigs, the report of a gun, etc.
	90	*batúshi*	to fire a popgun — i.e., by pushing
	91	*thitúshi*	to snap the fingers, to fire a gun once — i.e., by pulling the trigger
	92	*tutúshi*	denotes the frequent crackling or breaking of twigs and small branches, or the frequent discharge of fire-arms
42		***túxi***	–
	93	*thitúxi*	marks a crackling sound made by pulling
43	94	***xátho^{n}***	describes the sound made in brushing against or pulling through sun-flowers, grass, or leaves
	95	*baxátho^{n}*	denoting the action by pushing
	96	*thixátho^{n}*	… by pulling
	97	*gaxátho^{n}*	… by hitting
		etc., etc	
44	98	***xtházhe***	to scream or cry out, as a young animal does
	99	*thaxtháxtházhe*	to talk or sing in a quavering voice
	100	*bixtháxthazhe*	to make a flute give forth quavering notes,
		etc., etc.	
45	101	***xthó^{n}zhe***	marks a crunching sound
	102	*baxthó^{n}zhe*	to crush an egg-shell by pushing at it
	103	*thixthó^{n}zhe*	to make the crunching sound heard when a sled is pulled over firm snow on a frosty morning
46		***xthúde***	—
	104	*zho^{n}xthúde*	*to snore*

		Root lexeme; example	Definition
47	105	***xú'e***	the sound of which is given as *xxx*, describes the sound made in tearing calico, the roar of falling water (whence, *ni xu'e*, *a waterfall*), the sound heard in sawing or in scraping wood by pushing, as well as the whizzing of a whirled stick
	106	*ni xu'e*	*a waterfall*
48		***za***	— [Dorsey proposes a link with ***záde***]
	107	*no^{n}bé ugáza*	*the phalanges* (noun)
49	108	***za'e***[30]	a noise, buzz, confusion applied to the sound of millstones in motion
50	109	***záde***	usually conveys the idea of branching off or forking…
	110	*hú t^{h}e záde ínahi^{n}*	the voice is really indistinct – that is, the sound scatters instead of going straight to the person addressed
51	111	***zhudé***	refers to the expulsion of the breath by a person or animal that is nearly exhausted from running, etc.
52	112	***zíde***	denot[es] a hissing sound of confined air that is escaping
	113	*názide, názije*[31]	to make a sizzling sound, as when meat is broiling
53	114	***zúde***	denotes a whistling sound, such as a man makes
	115	*zuzúde wa'ó^{n}*	to whistle a tune, as a man does
	116	*gazúzude*	to roar or whistle often, as the wind does

[30] Dorsey does not write stress on this root in his paper, but it is attested as *za'é* in his texts.

[31] *Názije* corresponds *názide* with expressive palatalization (with diminutive meaning).

Appendix B

This table lists all the roots from 1 to 53 and specifies the part of speech they belong to and the features associated with each of them. The features are presented from Section 3.3 to Section 4.1, and summarized in Section 5.1.1. The roots excluded from the study are moved to the end of the table, after the line 'Total'.

- **Part of speech of the root**

Sound roots are all verbs (v). When they seem to be bound roots, 'bd' is added in parentheses. It is not clear whether the roots only found in collocation with *t^{h}ígthe* or *t^{h}íthe* are bound roots, so a question mark is added. The root *k'úshi* is used as a verb by at least one speaker according to Dorsey (1892: 3), while others only use it with derivational prefix (i.e., as a bound root). The roots eliminated from the data set in Section 2.2. include various parts of speech, including 'n' for 'noun' and 'onom' for 'onomatopoeia'.

- **Suffix** *-é*

'Y' means that the root (with or without an instrumental prefix) is attested with the suffix *-é*.

- **Collocation with** *t^{h}ígthe* **or** *t^{h}íthe*

'Y' means that the root (with or without an instrumental prefix) is attested followed by *t^{h}ígthe* or *t^{h}íthe*.

- **Collocation with** *égo^{n}*

Cells of this column are filled when a collocation with *égo^{n}* 'to be (somewhat) like it' is attested for the root. I specify whether the construction with *égo^{n}* concerns the root by itself ('root'), the reduplicate root ('RED'), the root with a prefix *wa-* or an instrumental prefix ('ins.').

- **Instrumental verbs with unusual features**

Cells of this column are filled when the root is attested in an instrumental verb with unusual features. The content of each cell specifies what type(s) of unusual feature(s):

- ‘intr.’ means the verb is intransitive, while a causative derivation is expected;
- ‘*égo*^{n}’ means that it is attested in collocation with *égo*^{n} ‘to be (somewhat) like it’. (Note that in this case, it is redundant with the preceding column.)
- ‘modif.’ means it is used as a verb modifier, as in example (28).
- ‘redun.’ means the prefix’s meaning is redundant with another verb, as in examples (28) to (31).

Numbers in parentheses specify how many examples were found for each type of feature. For instance, the root *kúge* is found in one example in an instrumental verb acting as a verb modifier, and where the prefix is semantically redundant. The root *sathú* is attested three times in intransitive instrumental verbs, one of which is also followed by *égo*^{n}.

- **Consonant gradation (CG)**

‘Y’ indicates that the root is linked to another by consonant gradation; ‘—’ indicates that the root has no fricative; an empty cell means that the root is not linked to another by consonant gradation, even though it has a fricative.

	Root	Part of speech	*-é*	*t*^{h}*ígthe, t*^{h}*íthe*	*égo*^{n}	Instrumental verbs with unusual features	CG
1	***ʼáx̣e***	v		Y			
2	*bthó*^{n}*x̣e*	v (bd?)		Y			Y
3	*ch*^{h}*áki*	v (bd)					—
4	*ch*^{h}*ízhe*	v (bd)					Y
5	*dáx̣e*	v (bd)			ins.	intr. & *égo*^{n} (1)	Y
6	*dáze*	v (bd)					Y
7	*dúx̣e*	v (bd)					Y
8	*gíze*	v					Y
9	*k’áx̣e*	v (bd)				intr. (1)	
10	*k’éx̣e*	v (bd)					
11	*k’ushi*	v (bd?)	Y	Y		intr. (1)	

Root		Part of speech	*-é*	*t^{h}ígthe, t^{h}íthe*	*égo^{n}*	Instrumental verbs with unusual features	CG
12	*kámo^{n}*	v (bd)					—
13	*kátho^{n}*	v (bd)				*t^{h}íthe* (1)	—
14	*ku*	v (bd)					—
15	*kúge*	v				redun. & modif. (1)	—
16	*p^{h}úki*	v (bd)	Y	Y	ins.	*égo^{n}* (2); *t^{h}ígthe* (1)	—
17	*s'ú*	v (bd)					
18	*sáp^{h}i*	v			ins.	*égo^{n}* (1)	
19	*sathú*	v (bd?)			*wa-*	intr (2); redun. & intr. (2)	Y
20	*shathú*	v (bd)					Y
21	*shka*	v (bd)					
22	*shkáp^{h}i*	v (bd?)		Y	ins.	intr. & *égo^{n}* & *t^{h}ígthe* (1); intr. & *égo^{n}* (2)	Y
23	*shtáki*	v (bd)					Y
24	*skáp^{h}i*	v (bd)					Y
25	*sú'e*	v					Y
26	*támo^{n}*	v (bd)					—
27	*táshi*	v (bd)	Y	Y	ins.	intr. & *égo^{n}* (2)	Y
28	*tási*	v (bd)	Y	Y	ins.	*égo^{n}* (4)	Y
29	*táxi*	v (bd)	Y	Y	ins.	intr (1); redun. & intr. (1); *égo^{n}* (4); intr. & *égo^{n}* (1); *t^{h}ígthe* (1)	Y
30	*tíde*	v (bd)		Y	ins.	intr. (2); intr. & *égo^{n}* (1)	—
31	*túp^{h}i*	v (bd)					—
32	*túshi*	v	Y	Y	ins.	intr. & *égo^{n}* (1)	Y
33	*túxi*	v (bd)			ins.	intr. & *égo^{n}* (1)	Y
34	*xátho^{n}*	v (bd)					
35	*xtházhe*	v		Y			

	Root	Part of speech	*-é*	*t^hígthe, t^híthe*	*égo^n*	Instrumental verbs with unusual features	CG
36	*xthó^{n}zhe*	v					
37	*xthúde*	v (bd)				intr. (1)	
38	*xú'e*	v		Y	ins.	redun. & intr. & *égo^n* (1); redun. & intr. (1)	Y
39	*za'é*	v		Y			
40	*zhudé*	v					Y
41	*zíde*	v (bd)					
42	*zúde*	v			root, RED		Y
	TOTAL		**6**	**13**	**13**	**17**	**20**
43	*dazhe*	v (bd)					Y
44	*dúzhe*	v (bd)					Y
45	*hák^{h}ugthe*	n					—
46	*héch^{h}i^n*	v					—
47	*hu*	onom / v					—
48	*húxpe*	v					
49	*káẋe*	n					
50	*k^{h}uuu*	onom					—
51	*mo^n*	v (bd)				*t^hígthe* (1)	—
52	*za*	v (bd)					Y?
53	*záde*	v					Y?