

Sound Symbolism in Alaskan Athabascan Languages

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Traditional Sausseurian linguistic theory views the relationship between sound and meaning in language to be essentially arbitrary (Sausseur 1989). Philosophers and linguists since the time of Plato, however, have wondered if the sound of a word and its meaning may in fact bear some non-arbitrary relation to each other. This has led to the theory of SOUND SYMBOLISM, which encompasses a broad range of potential non-arbitrary connections between sound and meaning, from the familiar forms of onomatopoeia within a single language to possible correlations between phonemes and physical qualities that span across unrelated language families. In the summer of 2005, I worked at the Alaska Native Language Center (ANLC) in Fairbanks, Alaska, and was able to collect data on sound symbolism in Ahtna, Koyukon, and Lower Tanana, three ATHABASCAN languages in southern and central Alaska. My data was assembled both from dictionaries in the ANLC's archives and by consultation with a native speaker of Lower Tanana. This thesis examines sound-symbolic patterns in these three languages, looking at several semantic categories as well as the morpheme common to all Alaskan Athabascan languages which marks onomatopoeic words. These patterns are then compared to similar sound-symbolic categories in other unrelated languages.

Sound Symbolism

Sound symbolism describes a variety of relationships between sound and meaning in language. As this subject has only recently been looked at by mainstream linguistics, it still suffers from a lack of agreed-upon terminology. Terms such as "onomatopoeia", "mimetics", "phonaesthemes", and "ideophones" are all grouped under the umbrella of "sound symbolism" without a common understanding of what categories these terms distinguish. Hinton, Nichols, and Ohala in 1994 proposed a division of sound symbolism into five main types, three of which are relevant to this paper. Table 1 summarizes their system, which provides a starting point in the search for a common system for subcategories in sound symbolism.

[1]

Corporeal	Involuntary vocalizations such as cries of pain, sneezes, or hiccups; interjections.
Imitative	Words imitating environmental sounds, "onomatopoeia", often become lexicalized.
Synesthetic	Words symbolizing "visual, tactile, or proprioceptive properties of objects, such as size or shape"; very often lexicalized.
Conventional	Association of phonetic qualities with semantic values through a process of analogy or attraction; language or family-specific.
Meta-linguistic	"segment choice and intonation patterns signal aspects of linguistic structure and function"

from Hinton et al. 1994:1-8

The most widely documented and accepted form of sound symbolism is what has traditionally been referred to as "onomatopoeia", and which Hinton et al. (1994:3) label IMITATIVE sound symbolism. These words mimic animal noises or other non-human sounds such as weather, friction, or impact. Most of my data falls into this imitative category. Cross-linguistically, many of these words have a strongly rhythmic element to them, such as reduplication; Hinton et al. observe that, "Just as humans are capable of translating rhythmic sounds into rhythmic movements [dance, clapping], they are also capable of...translating rhythmic movements into sounds..." (ibid) This was not a feature of sound symbolism which I had much opportunity to study, however, as research in the Alaskan Athabaskan languages has so far found no evidence of reduplicating morphology.

Less widely studied and accepted are more abstract forms of sound symbolism, which Hinton et al. (1994:4) have termed "synesthetic" sound-symbolism. I feel that this term is somewhat misleading, given the medical condition by the same name¹, and propose instead the term METAPHORICAL sound symbolism. Their description of the

1 Synesthesia refers to the medical condition in which a person's brain becomes "cross-wired", and causes them to perceive stimuli normally perceived with one sense with a different sense organ -- seeing sounds or hearing smells, for example.

phenomenon, however, remains accurate. In metaphorical sound symbolism, sounds are used to describe qualities of an object or event other than actual sound, such as movement, color, size, shape, or consistency. The distinction between imitative and metaphorical sound symbolism is more of a continuum than two distinct sets, as words describing, for example, friction sounds, are attempting to imitate noises so foreign to the human vocal tract that they are well on their way to being metaphor.

Many languages have extensive, often productive, systems of metaphorical sound symbolism unique to a particular language or language family. Hinton et al. define these as CONVENTIONAL sound symbolism, and I feel that they should more usefully be considered as a subset of metaphorical sound symbolism rather than a separate category. These forms possess all the features of metaphorical sound symbolism, but are confined to one language or family. Conventional sound symbolism generally arises through a process of attraction. Bloomfield most expressively describes the process:

"Every word, in so far as it is semantically expressive, may establish, by hap-hazard favoritism, a union between its meaning and any of its sounds, and then send forth this sound (or sounds) upon predatory expeditions into domains where the sound is at first a stranger and a parasite. A slight emphasis punctures the placid function of a certain sound-element, and the ripple extends, no-one can say how far..." (Bloomfield 1885:409)

An example of this process in English is word-initial [gl-] being associated with brightness or sparkle (e.g. glint, glow, glitter, glimmer), which appears to come from an Indo-European root, and probably does not say anything about an innate human association of [gl-] with the quality of "shininess". This process is very much in keeping with arbitrary sound-meaning connections in language, and is an example of a self-organizing system -- a situation in which seemingly random events over time form a pattern. The original "seed" of sound-symbolism is an arbitrary association of a

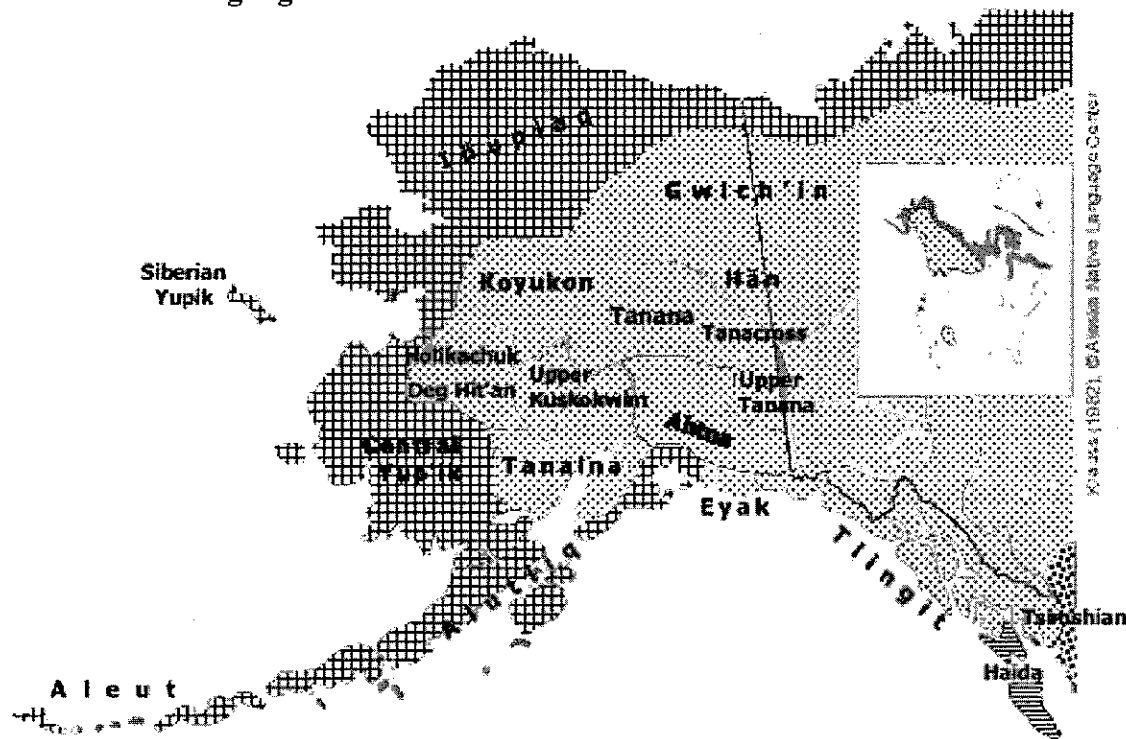
particular sound with a particular meaning. This sound-meaning connection, however, may trigger associations with other words which have similar sound or meaning in the minds of speakers. This causes speakers to associate the words with each other, and can over time cause the words to become more similar phonetically or semantically, which increases the attraction of that particular sound-meaning correlation for other words. They form what Dwight Bolinger terms "word constellations". (Bolinger 1940:69)

Theories have been advanced for potential universals in metaphorical sound symbolism. The most widely documented is the association of high vowels with small, light objects and low vowels with large, heavy objects. (Hinton et. al 1994:4 cite Ultan 1978; also see Nuckolls 1999) There are a variety of physical and psychological theories for the origin of this phenomenon, and counter-examples have also been examined². For a comprehensive description of historical and modern experiments with cross-linguistic sound symbolism, see Allott 1995. Allott finds that many of the studies show at least weak connections between sound-symbolism patterns in unrelated languages, although experiments involving both tonal and non-tonal languages tended to be less successful. My position on this is that while there is insufficient evidence to make any kind of confident claim about the presence or absence of universal patterns, there is enough data to warrant further investigation. If universal patterns do exist, they would interact with the self-organizing system of word constellations by making some sound-meaning correlations more attractive. Such connections would form arbitrarily at first, but once established, would be more likely to cause change in surrounding vocabulary than other

2 For physiological explanations of sound-symbolism, see Ohala 3-5. For counterarguments to vowel size-sound symbolism, see Diffloth in Hinton et al. 1994:107-108, and for a possible explanation of Diffloth's findings, see Tsur.

pairings. I will compare Athabascan sound-symbolic forms to proposed universal patterns to add to the growing body of data on the subject, but due to the limited scope of my data, attempting to use it to prove or disprove theories on universal patterns would be unreasonable.

Athabascan Languages:



The Athabascan language family³ is spread over the western coast of North America, concentrated mainly in Alaska, Canada, and the American Southwest. Navajo is the only member of this family not considered endangered, with an estimated population of approximately 150,000 speakers (approximately 7,600 monolingual). Most of the other Athabascan languages are endangered or moribund and have fewer than 500

3 Map from the Alaska Native Language Center, Fairbanks, AK (<http://www.uaf.edu/anlc/index.html>); colors modified for clarity. Small dots indicate Athabascan; Cross-hatches indicate Eskimo-Aleut family; other patterns indicate small isolate languages.

fluent speakers.⁴ There are, however, a number of native language and culture immersion schools and camps as well as language "apprentice" programs in place in Alaska and Canada in an effort to revive dying languages. The younger generation (early 20s and younger) are showing a growing interest in learning their grandparents' languages, somewhat reversing the trend their parents' generation set in moving to the cities, away from the stigma of "primitive" native language and culture.

Athabascan languages have a polysynthetic morphology with a rich system of case and modal affixes, including a noun classification system. The data I have collected includes mainly prefixes, but Athabascan languages are also suffixing, and occasionally infixing. This poses a challenge for analyzing possible connections between sound and meaning in Athabascan words, as in most cases only the root is sound symbolic, and this must then be teased apart from its accompanying morphology. There is one morpheme which must be applied to any sound-symbolic word, although the morpheme itself cannot be sound-symbolic, as it is effectively the same in all instances. It is generally referred to as the "d-" morpheme, and is realized as either "d-" or "de-", depending on what it prefixes. It tends to go very close to the root, but is not always directly in front of it. More research examining the interaction of this morpheme with other affixes would be a topic for further study. When applied to a root, it primarily carries the sense of "sound of", although it has several related meanings pertaining to human speech which are not relevant to this thesis. It appears to attach to any root whose meaning is a noise or something capable of making noise.

Occasionally, the "d-" morpheme has a more causative meaning, as in the Lower

⁴ Data from Alaska Native Language Center based on estimates from 1980 and 1981 censuses, and the Ethnologue based on 1990 census.

Tanana root meaning "wild rhubarb" (*gutth*) gaining the meaning of "crunching sound" (lit. "the sound of wild rhubarb") when used sound-symbolically. The "d-" morpheme attaches to a wide variety of grammatical functions and semantic fields; I hypothesize that it was once at least partially productive, given how widespread it currently is. My native consultant, however, rejected my few attempts to create new sound-symbolic forms from roots that I thought likely to potentially make sounds, so the morpheme may be largely frozen now. It is also entirely possible that I simply created incomprehensible morphology due to having a very tenuous grasp on Athabascan grammar; this would be an issue to examine in future field research when I have a better understanding of the language.

The languages I primarily examined for this thesis were Ahtna, Koyukon, and Lower Tanana. Ahtna (also called Atna, Ahtena, Copper River, and Mednovskiy) is spoken by approximately 80 people (from Ethnologue, data from Krauss 1995), all over 50 years old, in Alaska's Copper River region. The speakers rarely use their language and it is considered nearly extinct, although there are revitalization efforts in place. Koyukon (also called Ten'a) is spoken by approximately 300 older adults, none of them monolingual, around Alaska's Koyukuk river area. (ibid) There have been several books of traditional hunting stories and legends published in Koyukon, and a few younger speakers are literate in the language, although they are not native speakers. Lower Tanana is the most severely endangered of these three languages, having only about 30 native speakers in 1995, all older adults (ibid). It is spoken mainly around the Tanana River, Nenana, and Minto regions near Fairbanks, Alaska. The three languages are closely related, and while only minimally mutually intelligible, it is not uncommon for

speakers to be fluent in more than one language or to have vocabulary from another dialect come into their native language due to the drastically reduced pool of native speakers.

Research Methods:

My initial data was taken from native language dictionaries. For Ahtna, I used *Ahtna Athabascan Dictionary* by James Kari, published in 1990 by the Alaska Native Language Center. My Koyukon data is from *Koyukon Athabascan Dictionary* by Jules Jette and Eliza Jones, also published by the Alaska Native Language Center in 2000. The Lower Tanana data comes from a digital copy of drafts of James Kari's *Lower Tanana Dictionary*, which has not yet been published in that form (a previous draft had limited publication in 1994). I had access to digital versions of all three dictionaries, which enabled me to simply search for the "ono" (onomatopoeia) tag which the writers used to label sound-symbolic words. Words containing the "d-" morpheme were always classified as onomatopoeia even though some were actually more broadly related to human speech. Such speech words and loanwords (mainly from English or Russian) had to be weeded out, and obvious close cognates were grouped together so as not to skew the data. Including more words in the same semantic fields or containing similar phonetic patterns, but not marked as onomatopoetic, is beyond the scope of this thesis but would be a useful area for further research.

All three dictionaries are organized alphabetically by root or affix. After each base word there follow examples of possible shades of meaning which result from the addition of various morphology, along with examples. Figure 2 is an entry from the

Koyukon dictionary for the root 'ok':

[2] 'ok' /bubbling water/

ka'o'ghadax bubbles are coming up from below; *syii 'o' tezyaa* my insides are bubbling, my stomach is upset

ono 'ok'

cust 'uuk'

d+l+'ok' (op-ono) be growling noise (of upset stomach)

syii del'o' my stomach is growling (ono)

The lines beginning "ono" and "cust" after the main entry describe how the root changes when used in different aspects or moods -- in this case, onomatopoeic and customary. Entries can be considerably longer than this, occasionally going on for a page or more in the case of several common affixes. Words such as *ka'oghadax* above seem phonetically and semantically to be potentially sound-symbolic, but are not morphologically considered as such because they do not possess the "d-" morpheme. The set of Athabascan words which follow sound-symbolic patterns may be considerably larger when words which do not fall into the onomatopoeic category morphologically are included.

While in Fairbanks this past summer (2005), I worked with Isabelle Charlie, a very fluent native speaker of Lower Tanana who lives in Fairbanks. She is probably in her late 60s and moved to Fairbanks after growing up in the Minto area. I was able to elicit only a few independently produced sound symbolic forms in the context of stories; while Mrs. Charlie is an excellent consultant, she no longer has a linguistic community in which to practice the creative use of her native language. I was, however, able to verify the data I had collected from the Lower Tanana dictionary, as well as some forms from Koyukon, which she also speaks. I met with Mrs. Charlie several times in the summer of 2005. I sat in on sessions by the professors and graduate students I worked for at the

ANLC, usually James Kari, Siri Tuttle, and Janna Urschel. They were mainly concerned with eliciting verb paradigms for Janna's master's thesis, but I had opportunities to ask questions for my own research. Mrs. Charlie was very enthusiastic about us documenting her language, and was interested in my search for sound words. Much like in English, onomatopoeia in Lower Tanana seems to be regarded as a rather playful aspect of language; Mrs. Charlie found it amusing that I wanted to hear sound words rather than trying to figure out more technical grammatical data like the other researchers.

On the first session in which I had an opportunity to ask questions, I came up with a short list of sounds in English with the help of Professor Tuttle and asked Mrs. Charlie if she had a word for them in Lower Tanana. The two sounds she immediately thought of words for were the ringing of a bell or telephone -- [deneltl'isr] -- and the sound of whistling -- [yudeɬyuɬ]. One word Professor Tuttle had encountered before with other consultants that Mrs. Charlie confirmed was [doch'editedle'iya], which does not really have an equivalent in English, as it is the sound of silence. I then went through the Lower Tanana dictionary and inquired about several words each session, asking if she knew the word, and what it meant for her. Many of the words she agreed with completely, which is not surprising given that she was one of the native speakers consulted for the writing of the dictionary.

Other words she had heard before, but she had either a slightly different pronunciation or a different definition (although in all cases her definition was within a reasonable semantic distance from the dictionary's, and so was probably due to dialect or individual language difference). For example, the dictionary claimed that [delchen'] was used for the sound of both tree squirrels and ground squirrels (creatures of quite different

appearance but which produce somewhat similar noises), but Mrs. Charlie only used the word for ground squirrels. She used the word [deldlic] for tree squirrels. [dlega deldlic] means "the tree squirrel is chattering". [deldlot], which the dictionary defined as the sound of a bear growling, she agreed was a Lower Tanana word that she had heard before, and thought the dictionary's definition sounded reasonable, but it wasn't a word which she used often enough to be sure of the meaning.

In some cases I encountered words in the context of stories that I expected to have sound-symbolic morphology, but didn't. Describing paper ripping, Mrs. Charlie used the word [yiɬch'eɬ], which translates as "the paper is ripping/being ripped". The root **ch'e/** is listed as onomatopoeic in the dictionary, and Mrs. Charlie identified the word as being the one she would use to describe the sound of paper ripping, but it does not possess the characteristic "d-" morpheme normally used for sound-symbolic verbs. This exchange gave weight to my hypothesis that the set of Athabascan sound-symbolic words is much larger than the set of words marked by the "d-" morpheme.

One of the most extensive examples of Lower Tanana sound-symbolic verbal morphology occurred when Janna and I combined her verb paradigms with my sound words to create a partial paradigm for the verb meaning "to snore". This helped to demonstrate how the onomatopoeic roots and morphology interact with the rest of the language; the root these forms are based on is **gux**:

[3]

[ch'edenitɬgux]	I am snoring.
[ch'edeneɬgux]	He is snoring.
[ch'etr'edenɬgux]	We are snoring.
[ch'exedenɬgux]	They are snoring.
[ch'deneghetɬgux]	I snored.

These forms all have the "de-" prefix, which occurs somewhere in the middle of the word, depending on what person, number, and tense markings are present.

Some words in my dictionary turned out to not actually be Lower Tanana words at all -- the dictionary contains words from Koyukon, Ahtna, and Dena'ina which have not been entirely weeded out (as far as I know, I have managed to remove them all from my data set). These non-Lower Tanana words represent the influence of loanwords and consultants who speak multiple languages. Speakers may be used to using one language to discuss, for example, dancing, and another to discuss hunting, depending on where they most often engage in these activities. Since the languages are closely related and most communities are multi-lingual, the distinction between languages is not always as important for speakers as it is for the writers of dictionaries. Loanwords from English, Russian, and Eskimo-Aleut languages also exist in Ahtna, Koyukon, and Lower Tanana, but for the most part these are simpler to identify and are marked as such in the dictionaries I consulted. There are very few loanwords of this type which occur in sound-symbolic forms.

Data and Analysis

I have organized data for Ahtna, Koyukon, and Lower Tanana. I combined all three languages, dividing them into several semantic categories. The semantic areas which had the greatest number of words and showed the strongest correlation between sound and meaning fell into the general categories of impact sounds and friction sounds. Some, such as the rustling of someone walking through leaves, fell somewhere in between; the two categories form a continuum both phonetically and semantically. I had

smaller data sets for several other types of sounds such as squeaking, water noises, and wind or voice sounds. There were also a large number of animal noises, but as I have no idea what many of the animals actually sound like, and many of them are only native to Alaska, there is very little comparative potential in that data set.

All three languages all share virtually the same phonetic inventory, but linguists have historically used a different orthography for each language. I have maintained this practice here; please see the Appendix for a description of orthographic conventions.

The following charts list the root forms of words which can be used sound-symbolically. Because of Athabascan's polysynthetic morphology, none of these forms are found independently, as shown above with the verbs for "snore", but must have various morphology such as person, tense, and number applied to them. In the case of sound-symbolism, the "d-" morpheme usually must be added to a root in order for it to be used sound-symbolically.

Impact/Burst Sounds: (representative sample; A = Ahtna, K= Koyukon, LT=Lower Tanana)

[4]	<i>Root</i>	<i>Language</i>	<i>Sound-Symbolic Meaning</i>
	don'	(A,LT)	stringed instrument twang
	k'ats'	(A)	click
	ts'etl'	(A)	snap
	tek	(K)	crack, break
	ggut	(K)	thud
	tl'eetl	(K)	creaking crack of thin ice
	dwn'	(LT)	thud
	ghwtl	(LT)	break, crack
	dzok	(LT)	rattle, clatter

I collected a total of 46 words which fell into the category of impact or burst

sounds, which had meanings similar to English pluck, click, thud, crack, explode, or pop. In most cases, the root meaning was very similar to the sound-symbolic use, but in some cases, the meanings are more distantly related. For example, in Koyukon, /**lootl**/ meaning "tube" can be combined with the "d-" morpheme and other morphology to mean "resound hollowly".

[5]

<i>Impact/Burst</i>	<i>Initial Phoneme</i>	<i>Final Phoneme</i>
aspirated stop	19 (41.3%)	28 (60.9%)
unaspirated stop	12 (26.1%)	N/A*
unvoiced affricate	7 (15.2%)	5 (10.9%)
voiced affricate	2 (4.3%)	N/A*
unvoiced fricative	1 (2.2%)	6 (13.0%)
voiced fricative	4 (8.7%)	1 (2.2%)
nasal		0 5 (10.9%)
other continuant	1 (2.2%)	1 (2.2%)
vowel	N/A**	
ejective (any)	14 (30.4%)	11 (23.9%)
	total: 46	total: 46

*Aspirated stops and voiced affricates are prohibited root-finally.

**Vowels are prohibited word initially -- any word in these languages written with an initial vowel is actually pronounced with an initial glottal stop.

For each semantic category, I examined the initial and final phonemes. Almost all roots are monosyllabic, so there are no analyzable medial consonant patterns. There is no clear pattern in vowels from category to category for those categories which have enough elements to make confident judgments about, but I have made tentative hypotheses for some possible weak patterns. For the larger semantic categories, I have identified the

number of initial and final phonemes for each phonetic category, as well as the percentage of initial or final phonemes consisting of those phonetic categories.

This data indicates that in Ahtna, Koyukon, and Lower Tanana, stops and affricates, especially aspirated or unvoiced, dominate for plosive words. Stops and affricates make up almost 87% of the root-initial phonemes and over 70% of root-final phonemes. Approximately 40% of these words either start or end with an ejective (7 both start and end with one). Nasals, vowels, fricatives, and other continuants are extremely rare, especially word-initially. There does not seem to be any semantic pattern to root vowels, however more work with speakers to determine the exact meaning of the sound-symbolic uses would be helpful in finding vowel patterns.

Friction Sounds:

[6]

<i>Root</i>	<i>Language</i>	<i>Sound-Symbolic Meaning</i>
ghaats	(A)	scratching, grinding sound
ghuuts'	(A)	whoosh, footsteps in snow
k'aaɫ	(A)	sound of grinding, filing
yes	(K)	rustling, rubbing noise
zus	(K)	sound of friction
zeets	(K)	zip, rapid movement
ch'eɫ	(LT)	tear (v.)
ghut	(LT)	dragging sound of sled runners on snow
chasr	(LT)	sizzle

I collected 16 roots which have meanings related to friction. Words from other smaller categories may also fall into this data set. As with the impact sounds, most roots had a more or less onomatopoeic meaning on their own, but some had a more abstract meaning that only became sound-symbolic when combined with the "d-" morpheme.

[7]

<i>Friction</i>	<i>Initial Phoneme</i>	<i>Final Phoneme</i>
aspirated stop	4 (25.0%)	2 (12.5%)
unaspirated stop	1 (6.2%)	N/A
unvoiced affricate	2 (12.5%)	1 (6.2%)
voiced affricate		0 N/A
unvoiced fricative	1 (6.2%)	10 (62.5%)
voiced fricative	7 (43.8%)	0
nasal		0
other continuant	1 (6.2%)	2 (12.5%)
vowel	N/A	0
ejective (any)	5 (31.2%)	1 (6.2%)
	total: 16	total: 16

The patterns for friction words are not quite as clear-cut as those for impact words, mainly because the data set is considerably smaller. There does, however, seem to be a preference for unvoiced fricatives root-initially, and a weaker preference for aspirated stops. Root-finally more than 60% of the words contained an unvoiced fricative, which seems a very clear preference. This data set contained one word that did not fit perfectly in the table -- "**chasr**" from Lower Tanana. It was one of the only roots which contained a consonant cluster. While consonant clusters are very common in these languages in inflected words, they are relatively rare in roots. I counted it under the "other continuants" column, grouping it according to the final consonant. If the [s] is also included, this adds to the predominance of root-final unvoiced fricatives.

I collected a total of 197 sound-symbolic words. Many of the entries which did not fall clearly under impact or friction formed a continuum between the two. Others,

such as water sounds, fell into clear semantic categories, but did not have a clear phonetic pattern. They may actually fall within the impact/friction continuum, but in many cases I was unsure exactly what environmental noise was intended from the definition, and so felt too uncertain of its semantic value to place it. I am including samples of these less developed categories with preliminary notes on possible phonetic and sound-symbolic patterns so that they may be made a topic of further data collection and analysis.

Squeaking/Creaking noises:

[8]	<i>Root</i>	<i>Language</i>	<i>Sound-Symbolic Meaning</i>
	ggats'	(LT)	grinding, creaking
	ggiints	(A)	creak, squeak
	ggootl	(LT)	(joint) is creaky, arthritic
	tl'eetl	(K)	creaking crack of thin ice
	ts'aek	(A)	creak
	ts'EEK	(K)	creak, squeak
	zel	(A)	creaking sound, metallic clanging

This set suggests a preference for high vowels in creaking words, as well as for aspirated stops and affricates root-finally. "zel" is the one word in this set that does not seem to fit phonetically with the rest of the roots; it may simply be an arbitrary outlier, or it may actually belong in a different semantic category. "tl'eetl" was included in both this set and the impact set, as it seems to fall into both categories semantically and phonetically. It starts and ends with aspirated (and initially ejective) stops, but also contains a high vowel.

Crunching Noises:

[9]

<i>Root</i>	<i>Language</i>	<i>Sound-Symbolic Meaning</i>
cen'	LT, A	gnaw on hard, resistant object making a noise
giits	A	sound of footsteps in snow
gutth	LT	crunching sound (lit. of wild rhubarb)
ggootl	K	joint is creaky, arthritic
ghwth	LT	gnawing, crunching sound
ghaats'	A	scratching, grinding sound
k'on	A	crunch, gnaw

As with "tl'eetl", "ggootl" is included in two data sets, as it seems to overlap semantically. All entries in this data set begin with velar consonants of some kind, and they end with alveolar ones. There may also be a slight preference for high vowels. Words in this category fall somewhere in between impact and friction semantically and phonetically. They tend to begin with unaspirated stops or fricatives, but end with aspirated stops and affricates.

Water Sounds (sample):

[10]

<i>Root</i>	<i>Language</i>	<i>Sound-Symbolic Meaning</i>
'ok'	(A)	bubble
coz	(A)	sizzle
dlok'	(A)	splash
kk'əts*	(K)	sloshy, slurpy, smacking noise
t'aaɬ	(K)	sizzle
tles	(K)	sizzling sound made by breath freezing instantly when air is colder than -50 F
c'oz	(LT)	splash
dluut'	(LT)	slurp
kaas	(LT)	sizzle, water rushing

*The digital version of the Koyukon dictionary rendered schwas as @ due to formatting issues. The original vowel was any one of the Koyukon short vowels, which often become reduced in context.

I collected a total of 16 water-related sound words, but as this sample shows, the actual sounds represented varied greatly in semantic value. Words such as "bubble" and "splash" seem to be a subset of impact sounds, and behave phonetically much like impact sounds. "Sizzle" words, by contrast, behave much more like friction words phonetically, although a more accurate idea of exactly what physical sounds these represented would enable me to determine whether they belong with friction semantically. More field work, perhaps with recordings of different environmental sounds, would be useful here.

Rattle/Rustle Sounds:

[11]

<i>Root</i>	<i>Language</i>	<i>Sound-Symbolic Meaning</i>
'uuk'	(A)	rattle
detl	(K)	shake, tremble
duut	(A)	chatter, engine running
dzok	(K)	rattle, clatter
laaʈ	(K)	rattle
leetl	(K)	rustle
dhoyh	(LT)	rattle
tl'otl	(K)	rattle
ts'etl	(K)	crackling
ts'iits'	(A)	rustling noise
yaac'	(A)	rustle
zaay'	(A)	rattle

[12]

<i>Rattle/Rustle</i>	<i>Initial Phoneme</i>	<i>Final Phoneme</i>
aspirated stop	1 (8.3%)	8 (66.7%)
unaspirated stop	3 (25%)	N/A
unvoiced affricate	1 (8.3%)	1 (8.3%)
voiced affricate	2 (16.7%)	N/A
unvoiced fricative	0	2 (16.7%)
voiced fricative	2 (16.7%)	0
nasal	0	0
other continuant	3 (25%)	1 (8.3%)
vowel	N/A	0
ejective (any)	3 (25%)	4 (33.3%)
	total: 12	total: 12

These, like crunching sounds, fall somewhere in the middle of the friction/impact continuum semantically. There seems to be a preference for unaspirated sounds root-initially, and a strong preference for aspirated stops root-finally. Many of these sounds express repeated impact. In some other languages, this is expressed through linguistic reduplication, however Athabaskan does not use reduplication.

Animal Sounds (sample):

[13]	<i>Root</i>	<i>Language</i>	<i>Sound-Symbolic Meaning</i>
	'ak	(A)	call of ptarmigan or spruce grouse
	ghiin'	(A)	frog call
	yaank	(A)	squeak of a rabbit when it is being killed
	kuh	(K)	low muffled bark [dog]
	doo/	(K)	sandhill crane call
	tsets	(K)	call of a small songbird
	ggol	(LT)	call of raven when approaching food or when somersaulting
	gox	(LT)	dog cries
	duut	(LT)	chatter of tree squirrel

Many animal sounds begin with a stop consonant, and there is also a smaller set beginning with voiced fricatives. Given that these words are semantically so different, it remains to be seen whether the predominance of stop consonants is meaningful.

Cross-Linguistic Comparisons

The most widely studied cross-linguistic trend in sound symbolism is the correlation between size and vowel height. Unfortunately, the data I have so far in these languages does not allow me to make any kind of observation on this phenomenon.

There is less data on consonant patterns than on vowel symbolism, but what there is agrees strongly with my Athabaskan data. Oszmianska's 2001 study of English and Japanese sound symbolism includes an extensive analysis of the semantics of stops and fricatives. Oszmianska observes that "both in English and Japanese stops evoke an impression of abrupt or explosive sounds...such as hitting and explosion" (Oszmianska 2001:149) Fricatives, in contrast, describe "abrasion or air turbulence" (ibid). She goes

on to analyze a variety of sound-symbolic words which contain elements of both friction and impact. She finds that in both Japanese and English, "onset and coda,...in an iconic manner refer to the beginning and end of a particular extralinguistic sound" (Oszmianska, 150) Thus words such as "whack" evoke friction followed by impact, and thus begin with a fricative and end with a stop consonant. (In my dialect, and presumably in Oszmianska's, "whack" is pronounced [hwaek]. For dialects which have lost the initial [h], the word "thud" might be a more appropriate example.) This is very similar to my Athabaskan data. Oszmianska finds that the more metaphorical the meaning is, the less chance that it will be shared by the two languages; sound symbolism is regarded as preferred choices rather than unbreakable linguistic law. Tomoda's analysis of Japanese sound-symbolism agrees with Ozmianska's, concluding, "/k/ represents 'hard' images, /m/ and /n/ represent 'sticky' or 'wet' images, and /s/ represents an image of something hissing or leaking. (Tomoda:199)"

While Japanese and English have some of the most extensive research on sound symbolism of any of the world's languages, there is useful data to be found on a variety of other sound-symbolic systems. The following table compares friction and impact sounds in several languages. In most cases, the sources listed the words as being onomatopoeic, but did not classify them into semantic categories. Each table lists the language and major language family to which it belongs, then words which I have identified as being in that semantic category with the exact definitions in parentheses. Family affiliations were verified from Ethnologue. For each language, I have maintained the author's orthography; please see listed sources for each language for an explanation of orthographic conventions

[14]

Friction	
Japanese ⁵ (isolate)	syuu-syuu (hissing sound)
White Hmong ⁶ (Hmongic)	khis khuas (running through dry leaves), nrhiv nhravv (tearing, slow sound), rhij rhuaj (foliage, grass rustling)
various Siouan languages ⁷	s'u (sound of planing) sha-dhu' (swishing sound made in water) za-'e (sound of millstones) zi'de (hissing sound)
Bosavi ⁸ (Trans-New Guinea)	fa:fa:s (small wind, breeze, draft) sololo (sound of small things slinking along the ground at night) susulu (slide back and forth)
Tuvan ⁹ (Turkic)	suw suw (sound of the wind or whistle) xilir (fluttering, flapping) xalur (sound of paper rustling) ʃyʃ (sound of air escaping when you open a fizzy drink)
Somali ¹⁰ (Cushitic)	yulux (to pass through, swishing) waf (to skim past, with speed) dhac (to tear, with a ripping noise) dhiiq (to give out a hiss)

While this is only a brief sampling, these languages seem to follow very similar patterns to my Athabascan data. There are some notable semantic differences in categorizing words as impact or friction -- for example in Tuvan, friction locomotion sounds are generally expressed with d-l combinations, rather than the fricatives of many

5 from Oszmianska 2001

6 from Ratliff 1992

7 from Dorsey 1892.

8 from Schieffelin and Feld 1998

9 from Harrison 2004

10 from Dhoorre and Tosco 1998

other languages. This may be emphasizing the impact in the locomotion rather than the friction, as Tuvan uses fricatives to express other types of friction. As might be expected from the previous research studies involving tonal languages which I examined, Hmong bears the least resemblance to the patterns found in my (non-tonal) Athabascan data.

[15]	Impact
Japanese (isolate)	kotu-kotu (hitting a hard surface) pan-pan (clapping) pon-to (popping open a bottle)
White Hmong (Hmongic)	cij coj (elephant or wild pig, walking slowly) khawv khuav (jogging, steady run) tig taug (big, heavy sound; footsteps) tsiv tsuav (walking in mud)
various Siouan languages	na^ada'ghe (horse's feet on hard ground) Pu'ki (popping sound) Tchi'-zhe (crackling of twigs)
Bosavi	boto (pop) gagak (sharp, crisp sound) gudu (thump; tree hits ground and shakes) teketeke (sound of typing)
Tuvan (Turkic)	toq toq (knocking sound) xap xap (slapping, clapping) kiŋgir (a falling and clanging noise) kizirt (sound of wood breaking) dirs (sound of a glass breaking)
Somali	buc (to fall, splattering) qab (to slam) gub (to knock) bash (to crush, with a loud sound)

Impact sounds seem to follow the patterns I found in Athabascan languages even more closely than friction words. Similar to in Athabascan, I also found a much larger body of data for impact sounds in many languages than friction sounds; this is an area where there is potentially enough data for a much more exhaustive cross-linguistic study of sound-symbolism.

Conclusions

Athabascan languages exhibit an extensive, although most likely no longer productive, system of sound symbolism. Onomatopoeia is marked morphologically by the "d-" prefix, which when attached to any root conveys the sense of "sound of", as well as tangential meanings related to human speech. An analysis of roots to which the "d-" morpheme can attach with a sound-symbolic meaning shows some phonetic patterns within semantic groups, most strongly those of friction and impact. Impact or burst noises are represented phonetically by stops and affricates, whereas friction is marked by sibilants. There may be a much larger body of data when one considers words which follow the same semantic and phonetic patterns, but which are not marked by the "d-" morpheme. The two semantic categories form opposite ends of a continuum, with many words falling semantically and phonetically somewhere between them. These tendencies are found cross-linguistically, which may indicate a preference for certain phonemes to match certain semantic categories when applied to the self-organizing system of sound symbolism.

Appendix -- Orthographic Systems

Koyukon

Consonants		<i>Labial</i>	<i>Alveolar</i>	<i>Lateral</i>	<i>Palatal</i>	<i>Velar</i>	<i>Glottal</i>
stops	plain	b	d	dl	g	gg	'
	aspirated		t	tl	k	kk	
	glottalized		t'	tl'	k'	kk'	
Affricates	plain		dz				
	aspirated		ts				
	glottalized		ts'				
Fricatives/ Continuants	unvoiced		s	ɬ	yh	h	
	voiced		z	l	y	gh	
Nasals	unvoiced		nh				
	voiced	m	n				

Vowels:

Long: high front -- ee
 high back -- oo
 low front -- aa

Short: low back -- o
 schwa -- e*
 high mid back -- u
 low mid back -- (barred u)

*other short vowels are often reduced to schwa, and are sometimes marked as such in the dictionary

Ahtna

		<i>Labial</i>	<i>Alveolar</i>	<i>Lateral</i>	<i>Palatal</i>	<i>Velar</i>	<i>Glottal</i>
stops	plain	b	d	dl	g	gg	'
	aspirated		t	tl	c	k	
	glottalized		t'	tl'	c'	k'	
Affricates	plain		dz				
	aspirated		ts				
	glottalized		ts'				
Fricatives/ Continuants	unvoiced		s	ɬ	yh	x	h
	voiced		z	l	y	gh	
Nasals	unvoiced		nh				
	voiced	m	n				

Vowels:

Long: high front -- ii
 high back -- uu
 low front -- aa

Short: high front -- i
 mid front -- e
 low front -- ae
 low mid -- a
 mid back -- o
 high back -- u

Lower Tanana¹¹

		<i>Labial</i>	<i>Alveolar</i>	<i>Inter-Dental</i>	<i>Lateral</i>	<i>Alveo-Palatal</i>	<i>Velar</i>	<i>Glottal</i>
stops	plain	b	d	ddh	dl	j	g	'
	aspirated		t	tth	tl	ch	k	
	glottalized		t'	tth'	tl'	ch'	k'	
Affricates	plain		dz					
	aspirated		ts					
	glottalized		ts'					
Fricatives/ Continuants	unvoiced		s	th	ɬ	y	kh	h
	voiced	w	z	dh	l	y	gh	
Nasals	unvoiced		n					
	voiced	m	n					

Vowels:

Long: high front -- ee
 high back -- oo
 low front -- a
 low back -- o

Short: All reduced vowels are rendered as "e"

¹¹ Data from the Alaskan Native Language Center: <http://www.uaf.edu/anlc/orthography.html#lt>

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