What Sound Symbolism, Functionalism, and Cognitive Linguistics Can Offer One Another

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1 Introduction

Sound symbolism—non-arbitrary relations of either a natural or conventional sort between sound and meaning—has been the subject of speculation for many centuries and of research throughout this century. Yet sound symbolic phenomena have yet to be integrated fully into linguistic theories. Saussure (1959), in formulating his principle of the arbitrariness of the sign, explicitly rejected any significant role for such phenomena in language. Similarly, sound symbolism has never found a place within the generative perspective, in which the form and content of language are seen as distinct and independent.

In contrast, the primary theme of the functionalist and cognitive linguistic theories has been finding relations among linguistic form, content, and function. Moreover, in these related perspectives, language is seen as being meaningfully connected to non-linguistic entities such as cognition, the body, and the social and cultural context. Furthermore, these theories can comfortably handle phenomena that are probabilistic rather than deterministic or categorical in nature. These three characteristics are attributes of sound symbolic phenomena. Therefore, functionalism and cognitive linguistics should be able to incorporate sound symbolism. It is surprising that there has not been more attention to sound symbolic phenomena, which provide clear examples of form-meaning relations.

In this paper, I will first argue that research in sound symbolism can benefit from the functionalist and cognitive linguistics perspectives, providing examples from the literature as well as some original work. Second, I will outline one way in which research on sound symbolism can serve as a test and extension of these related linguistic theories.

1.1 What functionalism and cognitive linguistics can offer the study of sound symbolism

The recent volume *Sound Symbolism* (Hinton, Nichols and Ohala 1994) which originated from a previous BLS meeting, documents the extent to which sound symbolism permeates language. Most work on sound symbolism has focused on documenting the existence of such phenomena and searching for possible causes or bases. Less emphasis has been placed on investigating what functions these phenomena may serve.

1.2 A function of sound symbolism: Facilitator of learning and memory?

1.2.1 Berlin and O'Neill's proposal

Berlin and O'Neill 1981 and Berlin 1992, have put forth ideas which serve as an excellent starting point in asking what function(s) sound symbolism might play. In their research into folk taxonomies, they observed that 'semantic

transparency' (including both sound symbolism and metaphor) is distributed unevenly across the lexicon. Names for wild, rare, or uncultivated flora and fauna are more semantically transparent than are names for common, cultivated or domesticated flora and fauna. In Tzeltal, transparent terms such as *ch'ix te*, literally 'spine tree' contrast with opaque terms such as *ich* 'chili pepper' (Berlin 1992:255-60). This phenomenon is found in English as well; *bachelor buttons* and *Queen Anne's lace* are compound metaphorical labels for wildflowers, while *rose* and *tulip* are simple labels for common garden flowers. Likewise, *sloth* is a linguistically simple but sound symbolic label for a rarely encountered wild animal (*sl-* is a phonestheme [see sections 1.3, 1.4, and 2.3.3] that is associated with slowness or laziness, e.g. slow, sluggard, slacker, slouch) that contrasts with *dog*, a linguistically simple and arbitrary label for that common pet.

Berlin and O'Neill have suggested that this difference in semantic transparency/opacity is due to the different cognitive demands inherent in learning and remembering the two types of names. They argue that while repeated exposure to common names ensures enough opportunities for them to be learned and retained by rote memory, rare names are less easily learned and retained. They propose that semantic transparency, which ties the name to other information or imagery, serves as an aid to learning and memory.

1.2.2 The plausibility of Berlin and O'Neill's functionalist proposal

This proposal is largely consistent with literature on human memory (e.g. Craik and Lockhart 1972; Inoue 1991; Murakami 1982; Quenk 1964). In addition, studies of language acquisition support the idea that regular sound-meaning patterns are easier to acquire than irregular systems. In natural language learning, there is some cross-linguistic evidence that more regular morphological systems are learned earlier than less regular ones (e.g. Slobin and Bever 1982). Experiments on the acquisition of miniature artificial languages (Braine, Brody, Brooks, Sudhalter, Ross, Catalano, and Fisch 1990; Brooks, Braine, Catalano, Brody, and Sudhalter 1993) confirm that regularity aids acquisition.

1.2.3 Tests of the proposal

With Nameera Akhtar, I have begun to test whether sound symbolism can facilitate the word learning of young children, specifically, whether young English-speaking children can use sound symbolic information to narrow the referent of unknown words (Hutchins and Akhtar 1996). To date we have concentrated on phonetic symbolism of size and shape, two well-known types of sound symbolism. To test whether children are sensitive to this type of sound symbolism, we used a modified fast-mapping procedure. In tests of fast-mapping, the experimenter shows the child two or more objects and uses a nonsense label to ask the child for one of them.

For our version of this task, we created 16 pairs of toy-like objects. Eight of the pairs were identical except for the dimension of size, while the other eight pairs of objects only differed in shape. In addition, we created 16 pairs of labels composed of sounds found by previous researchers to be associated with one end

of the size or shape continuum. The labels were assigned to the objects according to sound symbolic criteria.

We presented each pair of toys simultaneously and then asked the child to give the experimenter one of them, using the appropriate label. The child's selection was scored as being sound symbolically congruent or incongruent with the label used. For the trials differing on the dimension of shape, all age groups selected the target object at levels significantly above that expected by chance. The four and five-year olds exhibited sensitivity to sound symbolism for size as well. Thus, there is preliminary evidence that by the age of three years, English-speaking children can make use of some types of sound symbolism to narrow the possible referent of new labels (see also Davis 1961; Irwin and Newland 1940; Newman, 1933). Further examination of the functions that sound symbolism may play in language acquisition and use should prove fruitful.

Much more work is necessary to determine to what extent social and cultural practices affect the degree to which sound symbolic devices are exploited in different languages and in one language throughout its history. Berlin (1992) has proposed, for example, that the use of sound symbolism might be negatively correlated with literacy, because written sources serve as external memory aids and lessen the burden on the individual's own memory. Such a proposal suggests that sound symbolism should be exploited to different degrees across languages and in one language as its speakers undergo cultural change. Some cross-cultural data support this contention. Research in non-European languages suggests that the frequency of onomatopoeic words may be higher in non-written languages than in written European languages. For example, approximately 49% of Tzeltal Mayan bird names are onomatopoeic (Hunn 1977), while the corresponding percentage is 39% in Kaluli (Feld 1982), 38% in Aguaruna (Berlin and O'Neill 1981) 37% in Canadian Delaware (Speck 1946 as cited in Berlin and O'Neill 1981), and 34% in Huambisa (Berlin and O'Neill, 1981), in contrast to 4% in French (Callebaut 1985), 7% in Dutch and 13% in Flemish (Verheyen 1943-1950 as cited in Callebaut 1985).

Some diachronic evidence also supports the idea that exploitation of sound symbolism is inversely correlated with literacy. While admittedly suffering from a lack of standardization of sampling methods, dictionaries of bird names in Latin and of French in two historical periods indicate that the percentage of onomatopoeic terms has decreased over time while literacy has increased (Callebaut 1985; Andre 1966). More research is necessary to determine to what degree use of sound symbolism is related to cultural and cognitive factors.

1.3 A functionalist classification of sound symbolism?

The functionalist perspective can be applied productively to sound symbolic phenomena in another way. While such phenomena differ considerably on a number of factors, they are usually classified by their degree of iconicity or the degree to which they conform to the morphophonological characteristics of the language (see Hinton, Nichols, and Ohala 1994). However, other factors may be

used to classify them, including their length and scope of reference. I propose a general iconic principle for sound symbolic phenomena:

More phonological material indicates more semantic specificity.

At the lesser end of the sound continuum, we find elemental phonetic symbolism. In this case, phonemes or phonetic features such as a vowel's place of articulation (high-low, front-back) or its F_2 frequency (Ohala 1983, 1994) have repeatedly been found to be associated with broad dimensions of meaning. For example, /i/, a high, front vowel with high F_2 frequency, is often associated with smallness, nearness, speed, brevity, lightness (in weight and luminosity), sharpness, and happiness, among other factors (e.g. Alspach 1917; Chastaing 1958, 1965; Newman 1933; Sapir 1929; Tarte 1974; Tarte and Barritt 1971; Trigo 1991; Ultan 1978).

Some languages, including English and the Austronesian family (see Blust 1988), exhibit a type of sound symbolism with more phonological content and semantic specificity than phonetic symbolism: phonesthemes. English phonesthemes are typically phoneme clusters occurring in word-initial or word-final position, which are conventionally associated with attributes of actions or objects. For example, *-ump* is found in many words referring to dense, compact, or heavy objects (e.g. *clump, lump, hump, bump, stump, plump*; see also Sections 1.4 and 2.3.3).

Malkiel (1990: 99-100) has proposed another type of sound symbolism that is spread across the entire word and has more phonological content than phonesthemes or morphosymbolism. For example, the pattern, $C_1VC_2C_2o/a$, is characteristic of Italian adjectives referring to foibles or negative attributes, such as *buffo* 'ridiculous', *fello* 'sinister, evil...', *giucco* 'foolish', *gobbo* 'hunch-back, crooked', *goffo* 'awkward', *matto* and *pazzo* 'mad, insane, deranged'.

Onomatopoeia lies at the largest end of the sound continuum. In this case, a whole word refers to a highly specific referent[1]. For example, *whippoorwill* and *bobwhite* refer to the birds that make those sounds, and *buzz* and *hum* to particular types of sounds. This is the highest degree of specificity or reference found in sound symbolic phenomena.

This proposed typology should be investigated further, as it is largely based on the IndoEuropean family. In addition, the phenomena at the ends of the continuum—phonetic symbolism and onomatopoeia—are best studied. Experimental work on the psychological reality of phonesthemes and morphosymbolism is especially lacking.

1.4 English Phonesthemes

In a series of studies, my colleagues and I (Hutchins 1995, 1997; Hutchins, Mervis, Robinson and Bertrand 1997) have been investigating the psychological reality of phonesthemes by testing whether native speakers will interpret nonsense words containing a phonestheme in a manner consistent with the probabilistic semantic association of that phonestheme. For example, in a study we are currently conducting, native English-speaking subjects hear unknown words each

containing a phonestheme and have to select one of four possible definitions for that word (see Table 1). Each definition offered to the subject is the semantic gloss of a phonestheme, only one of which appears in the unknown word. By chance, subjects should pick the corresponding definition only 1 in 4 times, yet the mean number correct, to date, is closer to 1/2 than 1/4. Likewise, when given a definition and asked to select which of four unknown words they think best expresses the definition, another group of subjects is also choosing the sound symbolically correct words at rates just above 1/2, twice as high as expected. These preliminary results, along with those from other studies in the series, suggest that phonesthemes are psychologically real to native English speakers.

Table 1: Testing the psychological reality of English phonesthemes

Subjects receive:	Subjects select:
A. /twɪʃ /	a. To turn, distort, entangle, or oscillate; or the effect of such an action
	b. To radiate out from a point or to be elongated.
	c. A line having breadth.
	d. Something careless, slovenly, or low.
(/tw/ is a phonestheme. The target answer is a.)	
B. Collision creating noise or action with abrupt end.	a. splan
	b. wrudge
	c. dack
	d. skwoof
(/ æk/ is a phonestheme. The target answer is c.)	

1.5 Summary

It is clear that work on sound symbolism can benefit from the theoretical perspectives of functionalism and cognitive linguistics and from the experimental methodology of psychology. I will now argue that research in sound symbolism can help to test and extend these theories.

2 What sound symbolism can offer cognitive linguistics and functionalism

Langacker (1991), like Saussure (1959), has noted that linguistic symbols are composed of two poles—phonological and semantic—and a symbolic relation between them. Such a characterization is fairly straightforward for words and morphemes. However, Langacker's more controversial claim is that every linguistic unit, from the smallest morpheme to the most complex grammatical phrase, is a symbol, and therefore is composed of these two poles. Thus, the task is to show that more complex units are composed of a phonological pole, a semantic pole, and the symbolic relation between the two.

In his work, Langacker elaborates the semantic commonalties of word classes such as NOUN and VERB, as have other researchers (e.g., Hopper and Thompson 1984). The phonological pole seems more difficult and less extensively treated.

For instance, Langacker (1991:293) says, 'we can posit a schema for the class of nouns, which we can abbreviate as follows: [THING/...]. This symbolic unit is maximally schematic at each pole; semantically its only specification is that it profiles a thing, while phonologically it has no specific content.'

However, if one puts aside the assumption of the arbitrariness of the sign, and is willing to accept probabilistic rather than necessary and sufficient features, the phonological poles of abstract categories can be schematized. Sound symbolic research has revealed certain phonological characteristics of word classes. Below I will give selected examples (see also the review by Kelly, 1992).

2.1 Phonological criteria distinguishing the classes VERB and NOUN in English

2.1.1 English verbs tend to have fewer syllables than do English nouns

Cassidy and Kelly (1991) provided evidence for this general statement from several different sources. First, they examined the Brown corpus, a large corpus of written English prose and found that nouns had more syllables than verbs, controlling for frequency and date of entry into the language. Cassidy and Kelly also examined a corpus of adult speech directed to children, finding again that nouns had more syllables, on average, than did verbs, using both type and token counts, and across the group of mothers whose speech was sampled. Cassidy and Kelly further found that native English-speaking adults and children (from 3 to 5 years) were sensitive to the syllabic differences between nouns and verbs and generalized this knowledge to new exemplars.

2.1.2 English nouns and verbs have different typical stress patterns

Kelly's (1988) analysis of written corpora showed that disyllabic English nouns typically are stressed on the first syllable, while verbs are stressed on the second syllable—for example, record / record, permit / permit. In addition, Kelly found that native English speakers are sensitive to the stress differences tied to word class. Moreover, he discovered that the syllabic stress pattern affected the likelihood that a word of one class would be extended to the other class. In other words, nouns that had the characteristic first-syllabic stress were less likely to be used as verbs than were those with the second syllable stress common to verbs.

2.1.3 Frequent English nouns and verbs have different typical vowel distributions

Sereno and Jongman's (1990; Sereno, 1995) examination of the Brown corpus indicated that highly frequent nouns and verbs differ in vowel distribution such that nouns have a tendency to have back vowels and verbs to have front vowels. Low frequency items, however, do not differ in vowel distribution by word class. Sereno and Jongman also showed that adult native English speakers are sensitive to and can make use of these probabilistic differences.

These three studies indicate that the grammatical classes NOUN and VERB have characteristic phonological shapes in English (see also the review by Kelly, 1992). In addition, these phonological patterns provide examples of what Malkiel (1990) called morphosymbolism.

2.2 Phonological content of other word classes

Phonological correlates of other word classes can also be identified. For example, Malkiel (1990) studied the transition from Latin to Spanish adjectives, noting that with time, adjectival forms became increasingly standardized toward a canonical phonological form. Despite descending from Latin adjectives of varying length, Spanish adjectives are primarily (though not exclusively) disyllabic. Likewise, most Spanish adjectives begin with a consonant. Many Latin adjectives that began with a vowel were lost or came to acquire an initial consonant (e.g., /j/ or /g/). In addition, Spanish adjectives canonically end in the gender-marking o/a (and are also marked for number). There seems to be a relation of degree between the probabilistic sound symbolic correlates of word class and the more regular morphological correlates (which of course have a sound component as well).

2.3 Phonological content of grammatical subclasses

Slobin (in press) has recently described the open lexical class as a collection of small closed classes. Similarly, Levin (1993) and others divide the category VERB into subclasses, by semantic and/or syntactic factors. The lexicon seems naturally to break down into small sets of words united by meaning and/or syntactic behavior. Below I will review evidence that sets of words sharing semantic or syntactic features may also share phonological properties.

2.3.1 Subclasses of adjectives

Malkiel's studies of morphosymbolism in the Romance languages provide examples of adjectival subclasses with shared phonological and semantic features. For example, the subclass of Classical Latin adjectives that refer to a physical defect, oddity, or undesired state is united phonologically by being disyllabic, having as first vowel either /æ/, /e/, /aj/, or /aɔ/, and ending in -us or -er. The Italian adjectives for foibles or negative attributes (described in Section 1.3) provide another example of an adjectival subclass united by sound and meaning.

2.3.2 Subclasses of nouns

A number of studies have identified probabilistic phonological characteristics of seemingly arbitrary gender classes (see the review by Kelly, 1992). In French, for instance, some word-initial and word-final segments serve to distinguish masculine from feminine nouns. Tucker, Lambert, Rigault, and Segalowitz (1968) showed that school-aged French children were sensitive to these phonological correlates of gender, and were able to use them to classify unknown words.

Trade and scientific names in English have also been found to have semantic and phonological organization. Rubin, Stoltzfus and Wall (1991) showed that categories such as brands of laundry detergents, non-prescription pain killers, and names of radioactive elements have characteristic phonological forms (See Table 2). These features can be used by native speakers to create and classify novel exemplars.

Table 2[a]: Phonological forms of noun subclasses

Category	Prototypical Examples	Modal Value of Property		
		# Syllables	Ending	Root Value
Laundry detergents	Tide, Cheer	1	(none)	English word
Pain killers	aspirin, Anacin	3	-/In/	no English meaning
Radioactive elements	uranium, plutonium	4	-/ium/	proper noun

[a] Table modified from Rubin, Stoltzfus, and Wall (1991)

2.3.3 Subclasses of verbs

Gropen and others (e.g. Gropen et al 1989) have suggested that some verb subcategorization frames may be correlated with phonological structure. For example, the English dative has two forms, a prepositional form (1a) and a double-object form (1b).

1a. John got a ticket for Mary.
1b. John got Mary a ticket.

Some verbs are restricted to the prepositional form (1c), partly for semantic reasons (they must be compatible with the idea of transfer of possession), and partly for phonological reasons. Polysyllabic and Latinate-sounding words are less acceptable in the double-object form (*1d).

1c. John obtained a ticket for Mary
1d. *John obtained Mary a ticket.

Gropen and colleagues additionally showed that adults and children (between 5 and 8 years) are sensitive to the phonological biases associated with these alternations.

Another possible instance of English verb subclasses being united phonologically involves phonesthemes. English phonesthemes commonly depict types of motion (see Rhodes 1994 and Rhodes and Lawler 1981 for other functions). In English, information specifying the manner of motion is often incorporated in the verb while path information is often specified in the satellite (e.g. Slobin 1996; Talmy 1991). Verbs that code for manner often contain phonesthemes (see examples below). I think many phonesthemes function to unite subclasses of motion verbs semantically and phonologically. This possibility needs more investigation.

2a. The bottle *fl*oated into the cave.
2b. The bird *fl*ew across the sky.
2c. The river *fl*owed into the ocean.

(/fl/ = to move smoothly, continuously or rhythmically; e.g. flap, flicker, flutter, flounder)

3a. The man *str*ode out of the room.
3b. The couple *str*olled across the lawn.
3c. The woman *str*etched across the table to get the book.

/str/ = to use muscles; or forceful action in a linear path; e.g. strain, straighten, strive)

4a. The infantry *tr*udged across the plain.
4b. The mare *tr*otted out of the barn.
4c. The child *tr*aipsed along the path.

(/tr/ = to locomote by foot; e.g. tramp, trample, tread, trek, trip, troop)

5a. The pendulum *sw*ung back and forth.
5b. The driver *sw*erved around the stalled car.
5c. The leaves *sw*ayed in the wind.

(/sw/ = to oscillate, undulate, or move rhythmically to and fro; e.g. swagger, swish)

6a. The car cr*ash*ed into the wall.
6b. The ball sm*ash*ed through the window.
6c. The knife sl*ash*ed into the fabric.

(/æʃ/ = to make flamboyant, violent, or destructive contact; e.g. clash, gnash, mash)

7a. The couple tw*irl*ed around the dance floor.
7b. The tornado wh*irl*ed across the flat plain.
7c. The caterpillar c*url*ed into a ball.

(/əl/ = to twist, double-back, knot, or intertwine; e.g. swirl, unfurl)

8a. The baby cr*awl*ed across the kitchen floor.
8b. The drunken man spr*awl*ed across the couch.
8c. The fishermen tr*awl*ed along the coast.

(/aɔl/ = to drag, stretch out, or lengthen; e.g. drawl)

9a. The car z*ipp*ed along the highway at 90 miles an hour.
9b. The children sk*ipp*ed down the path.
9c. On the way to the party, the woman n*ipp*ed into the store to buy a card.

(/ɪp/ = a brisk movement, action, or event; e.g. blip, flip, sip, skip, whip, zip)

2.4 Summary

The data reviewed in this section provide evidence that word classes and subclasses have canonical phonological shapes that are probabilistically associated with those categories. In other words, the phonological pole of these rather abstract categories is not empty of shared content or maximally schematic (containing only some unspecified phonological content) as suggested by Langacker (1991). Indeed, a phonological schema can be constructed for these categories that depicts the canonical sound pattern. Ideally, the generality of each canonical pattern should be quantified to provide an indication of the degree to which it is instantiated by various members of the category.

3 Conclusions

The research reviewed in this paper suggests that further work in sound symbolism can be guided productively by the theoretical perspectives of functionalism and cognitive linguistics. For example, a functionalist perspective has generated the hypothesis that sound symbolism serves as an aid to learning and memory (Berlin and O'Neill, 1981; Berlin 1992). This hypothesis deserves further empirical attention.

Likewise, research into sound symbolism can help test and extend cognitive linguistic and functionalist theories. For example, sound symbolic research has demonstrated that the phonological pole of more abstract linguistic categories is not empty. Such work confirms Langacker's (1991) basic description of the bipolar character of all linguistic symbols and augments his description of the phonological pole of word classes. New work on sound symbolism may help answer old questions about the nature, structure, and function of language.

NOTES

1. Leanne Hinton (personal communication) disagrees with this characterization, arguing that the whole word may not be involved in onomatopoeia. The disagreement may stem from slightly different ways of classifying sound symbolic phenomena. For example, I would classify the word *crash* (following Wescott 1987) as involving two phonesthemes, *cr-* associated with discordant noise, e.g. cry, creak, croak) and *-ash* (associated with flamboyant, violent, or destructive contact, e.g. mash, gnash, clash). The whole word *crash* refers to the entire idea, a more specific degree of reference. While sounds smaller than whole words may be mimetic or imitative (e.g. some examples of phonesthemes and phonetic symbolism), I reserve the label onomatopoeia for whole words.

REFERENCES

Alspach, E. M. 1917. On the psychological response to unknown proper names. *The American Journal of Psychology* 28, 436-43.

André, J. 1966. Onomatopées et noms d'oiseaux en latin. *Bulletin de la Société de Linguistique de Paris*. 61.146-56.

Berlin, Brent. 1992. *Ethnobiological classification.* Princeton: Princeton University Press.

Berlin, Brent and John O'Neill. 1981. The pervasiveness of onomatopoeia in Aguaruna and Huambisa bird names. *Journal of Ethnobiology* 1, 238-61.

Blust, Robert. A. 1988. *Austronesian root theory: An essay on the limits of morphology.* Philadelphia: John Benjamins.

Braine, Martin D. S.; Brody, Ruth E.; Brooks, Patricia J.; Sudhalter, Vicki; Ross, Julie A.; Catalano, Lisa; and Shalom M. Fisch. 1990. Exploring language acquisition in children with a miniature artificial language: Effects of item and pattern frequency, arbitrary subclasses, and correction. *Journal of Memory and Language* 29, 591-610.

Brooks, Patricia; Braine, Martin D. S.; Catalano, Lisa; Brody, Ruth E. and Vicki Sudhalter. 1993. Acquisition of gender-like noun subclasses in an artificial language: The contribution of phonological markers to learning. *Journal of Memory and Language* 32, 76-95.

Callebaut, B. 1985. Onomatopées et noms d'oiseaux en français. *Le Français Moderne: Revue Linguistique Française* 55, 49-77.

Cassidy, Kimberly Wright and Michael H. Kelly. 1991. Phonological information for grammatical category assignments. *Journal of Memory and Language* 30, 348-69.

Chastaing, Maxime. 1958. Le symbolisme des voyelles: Significations des 'i'. I. Symboles de cris et de mouvements. II. Symboles d'acuité et de petitesse. *Journal de Psychologie* 55, 403-23; 461-81.

Chastaing, Maxime. 1965. Dernières recherches sur le symbolisme vocalique de la petitesse. *Révue Philosophique de la France et de L'Etranger* 155, 41-56.

Craik, Fergus I. M. and Robert S. Lockhart. 1972. Levels of processing: A framework for memory research. *Journal of Verbal Learning and Verbal Behavior* 11, 671-84.

Davis, R. 1961. The fitness of names to drawings: A cross-cultural study in Tanganyika. *British Journal of Psychology* 52, 259-68.

Feld, Stephen. 1982. *Sound and sentiment: Birds, weeping, poetics, and song in Kaluli expression.* Philadephia, PA: University of Pennsylvania Press.

Gropen, Jess; Pinker, Steven; Hollander, Michelle; Goldberg, Richard; and Ronald Wilson. 1989. The learnability and acquisition of the dative alternation in English. *Language* 65, 203-57.

Hinton, Leanne, Nichols, Johanna, and John J. Ohala. 1994. Introduction: Sound symbolic processes. *Sound symbolism*, ed. by Leanne Hinton, Johanna Nichols, and John J. Ohala, 1-12. Cambridge University Press.

Hopper, Paul J. and Sandra A. Thompson. 1984. The discourse basis for lexical categories in universal grammar. *Language* 60, 703-52.

Hunn, Eugene S. 1977. *Tzeltal folk zoology: The classification of discontinuities in nature.* New York: Academic Press.

Hutchins, Sharon S. March 1995. Development of the ability to use phonesthemes as guides to the meaning of novel words. Poster presented at the biennial meeting of the Society for Research in Child Development, Indianapolis, IN.

Hutchins, Sharon S. 1997. English phonesthemes: Their variability, psychological reality, and compositionality. Emory University dissertation in preparation.

Hutchins, Sharon S., and Nameera. N. Akhtar. July 1996. Early sensitivity to sound symbolism in English-speaking children. Paper presented at the VIIth International Congress for the Study of Child Language, Istanbul, Turkey.

Hutchins, Sharon S.; Mervis, Carolyn B.; Robinson, Byron F.; and Jacquelyn Bertrand. 1997. Weeds in the garden of language: The psychological reality of English phonesthemes. Manuscript under revision.

Inoue, Tomoyoshi. 1991. Encoding activities by preschool children under orienting versus learning instructions: Are onomatopoeias associated with more concrete images? *Japanese Psychological Research* 33, 11-17.

Irwin, Francis W. and Elizabeth Newland. 1940. A genetic study of the naming of visual figures. *Journal of Psychology* 9, 3-16.

Kelly, Michael H. 1988. Phonological biases in grammatical category shifts. *Journal of Memory and Language* 27, 343-58.

Kelly, Michael H. 1992. Using sound to solve syntactic problems: The role of phonology in grammatical category assignments. *Psychological Review* 99, 349-64.

Langacker, Ronald W. 1991. *Concept, image, and symbol: The cognitive basis of grammar*. Mouton de Gruyter.

Levin, Beth. 1993. *English verb classes and alternations*. Chicago: University of Chicago Press.

Malkiel, Yakov. 1990. *Diachronic problems in phonosymbolism*. Philadelphia: John Benjamins.

Murakami, Yoshihoro. 1982. The facilitation effects of phonetic symbolism on paired associate learning. *Japanese Journal of Psychological Research* 24, 62-67.

Newman, Stanley S. 1933. Further experiments in phonetic symbolism. *American Journal of Psychology* 45, 53-75.

Ohala, John J. 1983. Cross-language use of pitch: An ethological view. *Phonetica* 40, 1-18.

Ohala, John J. 1994. The frequency code underlies the sound-symbolic use of voice pitch. *Sound symbolism*, ed. by Leanne Hinton, Johanna Nichols and John J. Ohala, 325-47. Cambridge: Cambridge University Press.

Quenk, Alexander T. 1964. Phonic shift as a function of inappropriate stimulus conditions. Dissertation Abstracts International, University Microfilms No. 65-3065.

Rhodes, Richard A. 1994. Aural images. *Sound symbolism*, ed. by Leanne Hinton, Joanna Nichols and John J. Ohala, 276-92. Cambridge: Cambridge University Press.

Rhodes, Richard A. and John M. Lawler. 1981. Athematic metaphors. *Chicago Linguistic Society* 17, 318-42.

Rubin, David C.; Stoltzfus, Ellen R. and Kirsten L. Wall. 1991. The abstraction of form in semantic categories. *Memory and Cognition* 19, 1-7.

Sapir, Edward. 1929. A study in phonetic symbolism. *Journal of Experimental Psychology* 2, 225-39.

Saussure, Ferdinand de. 1959. *Course in general linguistics*. W. Baskin, Trans. New York: Philosophical Library (Original work published in 1915).

Sereno, Joan A. 1994. Phonosyntactics. *Sound symbolism*, ed. by Leanne Hinton, Johanna Nichols and John J. Ohala, pp. 263-75. Cambridge: Cambridge University Press.

Sereno, Joan A. and Allard Jongman. 1990. Phonological and form class relations in the lexicon. *Journal of Psycholinguistic Research*. 19.387-404.

Slobin, Dan I. 1996. Two ways to travel: Verbs of motion in English and Spanish. *Grammatical constructions*, ed. by Shibatani, Masayoshi and Sandra A. Thompson. 195-219.

Slobin, Dan I. in press. The origins of grammaticizable notions: Beyond the individual mind. *The cross-linguistic study of language acquisition* Vol. 5, ed. by Dan I. Slobin. Cambridge: Cambridge University Press.

Slobin, Dan I., and Thomas G. Bever. 1982. Children can use canonical sentence schemas: A cross-linguistic study of word order and inflection. *Cognition* 12, 229-65.

Talmy, Leonard. 1993. Path to realization: A typology of event conflation. *BLS* 17, 480-519.

Tarte, Robert D. 1974. Phonetic symbolism in adult native speakers of Czech. *Language and Speech* 17, 87-94.

Tarte, Robert D. and Loren S. Barritt. 1971. Phonetic symbolism in adult native speakers of English: Three studies. *Language and Speech* 14, 158-68.

Trigo, Loren. 1991. Scales and diminutivization. *Linguistic Inquiry* 22(3), 578-83.

Tucker, G. R.; Lambert, Wallace E.; Rigault, A. and N. Segalowitz. 1968. *Journal of Verbal Learning and Verbal Behavior* 7, 312-16.

Ultan, Russell. 1978. Size-sound symbolism. *Universals of human language, vol. 2: Phonology*, ed. by Joseph H. Greenberg, 525-68. Stanford, CA: Stanford University Press.

Wescott, Roger W. 1987. Holesthemes or phonesthemes twice over. *General Linguistics* 27, 67-72.