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Accessibility as a driver of change

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I was both honored and surprised to be selected for the Outstanding Young Alumni Award this year. In the spirit of celebrating graduate accomplishments, I thought it is only fitting to use my lecture to highlight the research of one of the outstanding graduate students working in my laboratory, Zara Harmon. This lecture is summarized below. For a full description of this work, see Harmon and Kapatsinski (2017).

One of the most unique and uniquely attractive features of Indiana Linguistics has been its interdisciplinarity, encouraged by the structure of graduate education at IU. Ms. Harmon's work is a great example of how an interdisciplinary perspective can contribute fresh insights into classic questions. Her work brings together research in historical linguistics and language acquisition, and enriches them with insights from spoken word recognition and decision making. Both language change and language acquisition are rife with examples of semantic extension, often called *over-extension* in the acquisition literature. In historical linguistics, extension is perhaps the most common type of semantic change. It is also the most likely driving force behind grammaticalization – the diachronic process that turns lexical items into grammatical items. For example, *going* to have become extended from actual motion uses as in (1) to intention uses that no longer have a motion component in (2) to future uses in which the action may no longer be intended in (3).

- (1) A: *Why are you going to the store?* B: *I am going to buy bread.*
- (2) *Are you just going to continue sitting here?*
- (3) *You are going to buy bread, or else.*

While this process has often been described as 'bleaching' or 'semantic generalization', its outcome is often a marker whose range of uses forms a 'radial category' that is impossible to describe by a simple conjunction of semantic features. The classic example is presented by Dyirbal gender markers, one of which tends to mark nouns referring to 'women, fire and dangerous things' as well as some nouns that are merely phonologically similar to the nouns belonging to these categories (see Lakoff, 1987; Plaster & Polinsky, 2011). The complexity of contextual conditioning observed in such cases makes it clear that we are dealing with a marker that has been gradually extended from specific context to specific context, rather than one that has simply lost some of the semantic features it once had.

Bybee (2003) and Zipf (1949) have argued that the forms most likely to be extended to new uses are frequent forms. It is *going* and not *walking* or *running* that grammaticalizes into a future marker. However, others have questioned the causal role of frequency, pointing out that semantic extension can straightforwardly cause the frequency increases observed in grammaticalization. We thought it might be worthwhile to pursue an experimental approach, so that we could manipulate frequency and determine whether it causes any difference in extension.

Researchers in language acquisition have long been concerned with *over-extensions*, errors in which a child extends a form beyond the range of uses it has for an adult. For example, a child may use the word *kitty* to refer to a picture of a large horned bovine. It has been argued that over-extensions can occur when the child does not know the correct adult form or is unable to access it in the moment of production (Gershkoff-Stowe & Smith, 1997; Naigles & Gelman, 1995). "When you have no access to a cow, a kitty will do" (Zara Harmon, p.c.). Ms. Harmon's work provides an experimental demonstration that accessibility continues to affect the production choices of adults,

and that in fact differences in accessibility can explain diachronic extension as well as youthful over-extension.

As proposed by the Neighborhood Activation Model (Luce & Pisoni, 1998) for word recognition, we have argued that frequency is one of the most important influences on accessibility, and that its influence should be much greater in an open-set task than in a closed-set task. If accessibility differences drive semantic extension, speakers should preferentially extend frequent words to novel uses. Furthermore, this preference should be much stronger in normal production – an open-set task – than in a forced choice, closed-set task. This is precisely what we found. When participants were free to choose any form to refer to a novel meaning, they were likely to choose the more frequent forms. When they were instead given a forced choice between a frequent form and a rare one, neutralizing accessibility differences between them, the preference for using the frequent form disappeared. These results established that frequency can cause semantic extension by influencing form accessibility and thereby biasing competition for production in favor of frequent forms.

Interestingly, some research in language acquisition documented a seemingly contradictory effect of frequency: instead of being extended to new uses, frequent forms were argued to be more likely to be restricted to the uses in which they have been experienced (Xu & Tenenbaum, 2007). For example, having encountered one picture of a Dalmatian paired with the word *fep*, Xu & Tenenbaum's participants believed that *fep* is likely to mean 'any dog'. Yet, two *fep*-Dalmatian pairings later, they reported that *fep* refers only to Dalmatians. Ms. Harmon's work has shown that this entrenchment effect in comprehension can both co-exist and interact with the tendency to extend frequent forms to new uses. In some conditions – arguably the more natural ones – participants can show a production-comprehension dissociation: the frequent forms they extend to new uses are precisely the ones they are confident of never having seen used in that way. This is likely also true of over-extension in child language acquisition, though frequency effects have not been systematically explored in that domain. The high frequency of the word *kitty* may cause the child to rapidly learn that a cow is not a kitty, and that the word *kitty* is unlikely to refer to cows for adults. However, that same high frequency can also cause the child to use the word *kitty* to refer to cows, by making it exceptionally accessible.

In language change, speakers may be extending frequent words to new uses despite knowing full well that these extensions are novel and perhaps even believing them to be unacceptable. However, a listener who encounters these extensions has no access to the beliefs of the speaker: all they can observe is the speaker's language use. Unless that listener makes a negative social evaluation of the speaker, she will have no reason to believe these previously novel uses to be unacceptable. As is often the case in language change, use leads and beliefs follow. Once accessibility has driven the speaker to extension, it has "done its job": a language change has begun, and its future fate now depends on the social cache (implicit or explicit) of the innovating speakers and their followers.

If children were the only speakers extending frequent words to new uses, a historical linguist could perhaps be justified in ignoring frequency-driven extension as a driving force behind language change. A young child has little social cache – hence, her extensions are considered *over-extensions* and have little chance of being adopted by the community (see Bybee, 2010). The extensions of adults and adolescents, on the other hand, have much greater potential for uptake and adoption. However, the influence of frequency on accessibility does not fade away in adulthood, and accessibility differences continue to influence production choices. We therefore consider frequency-driven extension to constitute an important force behind many semantic changes we see around us. Consider the puzzling fact that *iterate* has been largely replaced by *reiterate* and then *reiterate again*. Bybee (2003) has attributed this development to habituation: because of its high frequency in the speaker's experience, *iterate* can no longer evoke the meaning of repetition well enough and needs to be reinforced by *re-*. The cycle then repeats with *reiterate* and *again*. However, note that *iterate* is not that frequent a word. Certainly not frequent

enough to produce habituation in the everyday sense of the term. We therefore believe that semantic extension of the *re-VERB* construction and the *VERB again* construction is the more likely explanation for this development (Harmon & Kapatsinski, 2017).

Accessibility-based choices are not limited to language. For example, salad bar patrons have been successfully nudged towards healthier choices by making those choices more accessible than less healthy alternatives (Rozin et al., 2011). Accessibility also has well-known effects on voter choice in elections that have driven (often unsuccessful) attempts to equalize media coverage and to randomly assign candidate names to positions on ballots. However, the influence of accessibility on behavioral choices has been studied largely in isolation from research on their uptake and imitation (despite Zipf, 1949). One of the most promising directions we are currently pursuing is examining the feedback loops that are initiated by accessibility nudging an agent towards a particular linguistic action in a complex social network.

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