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INVITED COMMENTARY

Leveraging language specific information

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Meaning comes in different shapes and sizes. Content words like *parrot* and *persimmon* and *perambulate* convey some important – and very specific – kinds of meanings. But the kinds of meaning that syntactic structures encode are of a different sort. They are more general and abstract than those kinds of words, and they are linked to the underlying organization of language. The essential insight behind syntactic bootstrapping is that children can leverage the way that structural elements connect to abstract meanings to help them acquire the more specific kinds of meanings in the content words.

For example, if a child hears "The girl gorped the dog" she can use what she knows about transitive argument structure to infer that the event being described probably involves both the girl and the dog in some kind of interaction with each other and that the girl will be more agentive than the dog. That amount of information could describe a wide variety of events and is not nearly as specific as the meaning of the verbs *pet* or *push* or *poke*. But it is nevertheless useful information to have for the learner who does not already know those words and wants to know what part of the world is being described by *gorp*.

As this description makes clear, though, syntactic bootstrapping was never intended to act alone as a learning mechanism. It is useful for learning word meanings only to the extent that the meanings encoded through structural and functional features of a language provide useful guidance. And structural meanings are overwhelmingly abstract. Even considering a broad range of structural elements (not just argument structure, but also elements such as case marking, verb morphology, function words of all sorts, particles, scrambling, or any kind of formal linguistic features), and even considering a wide variety of typologically different languages in the world, there are still only some types of meanings that can apparently be encoded through structural elements. These include concepts related to temporality, causality, individuation and just a handful of other equally abstract ideas. None of these meanings have the exquisite particularity of most content words. Therefore, in order to leverage the meanings supplied by these functional elements, the child needs to consider other sources, such as the meanings of known content words, the visual scene, knowledge about context, assessment of others' intentions, and more.

In Hacquard's keynote article (this issue), she aims to describe some of the ways that syntactic bootstrapping must be augmented in order to learn the specific meanings of

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some classes of words. Two of the additions she presents are really just specific applications of syntactic bootstrapping to new structural elements. Researchers have investigated a range of structural and functional elements that children could use for bootstrapping; indeed one of the earliest works in this area (Brown, 1957) looked at children's ability to use noun determiners and verbal morphology to guide their interpretation of new words. To the best of my knowledge, no one has ever considered modal meanings or illocutionary force within a syntactic bootstrapping framework, but the logic is the same in these cases as it is for any other structural encoding of meaning. To be fair, the structures that need to be tracked for modals are interestingly complex, and the elements in the world that need to be tracked in order to fix on illocutionary force are not ones typically discussed; nevertheless, these cases are both logically like other syntactic bootstrapping situations.

A second type of case considered by Hacquard involves a tool that is truly outside of the process of syntactic bootstrapping, namely, the use of scalar implicature for generating inferences about specific word meanings. Scales and the inferences we draw from how words are ordered on scales are invoked in a variety of ways in Hacquard's paper. Quantifier scales (*many* < *all)* provide part of the background motivation for incorporating pragmatics into the bootstrapping process. Attitude verbs (section 3.1) are broken down into multiple types of scales. Verbs of belief are ordered on a scale reflecting how thoroughly one is committed to the truth of a proposition: *Alex knows that Frankie left* anchors one end of the scale with a strong commitment while the verbs *think* and *say* provide decreasing commitments. One might also see Hacquard's comparison of verbs of belief and desire as showcasing a more general scale involving the relevance of truth at all. Modal verbs (section 4) provide yet another scale (*may* < *must*). Moreover, given the relationship described between these scaled items and a set of indirect speech acts, it is possible to see those as ordered on a scale – perhaps one of illocutionary forcefulness – as well. All of these kinds of scales are organizing sets of related concepts and her pragmatic bootstrapping relies on the learner being able to use information about the relationship among the words to make inferences.

Thinking about scalar implicature as a companion tool for syntactic bootstrapping highlights the distinctive role of language-specific representations in the process more generally. Syntactic bootstrapping requires two components and there is an implicit alignment between those components and different cognitive domains: the systematic relationships between structures and meanings are a form of language-specific information which may also reflect innate, language-specific knowledge; the inferential processes that allow the child to leverage those relationships with the world, however, can draw on information well outside the linguistic domain, including general learning mechanisms. It is a satisfyingly clean split that separates specialized linguistic content from general thinking processes.

Scalar implicature complicates this division. Although the scales of scalar implicature are sometimes marked structurally (e.g. the morphemes *-er* and *-est* in English: *pretty*, *prettier*, *prettiest*), many scales are totally unmarked as is true of all the scales discussed in Hacquard. Moreover scalar implicature can be used quite broadly, including ad hoc scales created purely through world knowledge (*assistant, associate,* and *full* are ordered on a scale in the U.S. academic world). On this way of thinking, scalar implicature is on a par with the non-linguistic cognitive processes (like inspecting the world or analyzing intentions) that have always accompanied syntactic bootstrapping. But on the other hand, the scales of scalar implicature are quite abstract and also serve an organizing function for language that is as potent as argument structure or temporal semantics or any other bit of abstract semantics that can be encoded structurally in language. Part of

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understanding the meanings of many classes of words, including many words discussed by Hacquard such as quantifiers, modals, and attitude verbs, requires one to understand how they are organized along their respective scales. On this way of thinking, scalar implicature is more akin to the language-specific side of syntactic bootstrapping and should be seen on a par with things like argument structure and functional morphology.

What Hacquard's paper suggests is that scalar implicature actually plays a different kind of role altogether. Scales organize many semantic representations whether or not they cash out in specific structural clusters. Scales do not themselves bear any specific meaning, abstract or otherwise: what they do is organize other meanings in a particular way. For linguistically embedded scales (such as modals), the process of scalar implicature is deeply entwined with the meanings of the words, but it is an open question whether the implicature itself is a language-specific process. Scalar implicature will not help a child narrow in on meanings in the same ways that syntactic bootstrapping does because it is made of different kinds of pieces. Nevertheless, it is clearly a tool that can augment children's efforts to bootstrap specific meanings from structures.

Syntactic bootstrapping depends on there being systematic links between form and meaning that are true organizing features of language. Hacquard reminds us that language has other kinds of organizing systems, and children leverage any kind of systematicity in their efforts to learn their native language.

Reference

Brown, R. W. (1957). Linguistic determinism and the part of speech. *The Journal of Abnormal and Social Psychology*, **55**(1), 1.

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