

Concepts and Composition in the Lexicon

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Compositional semantics is truth-conditional. Clauses are assigned truth values, and sub-clausal constituents are assigned appropriate individuals, extensions, or other semantic values to derive truth values for clauses (ignoring intensionality.) This view is wide-spread in semantics, and is embodied in the common type-driven approach inspired by Montague. It is an equally common, if highly simplified, idea that word learning involves associating sounds with *concepts* (e.g. Bloom 2000, Clark 1983). This raises a problem: concepts are mental representations, many of which do not appear to have the kind of structure that supports truth-conditional semantic composition. This is vividly illustrated by the view that some concepts have the structure of prototypes and similarity metrics (e.g. Rosch 1978). Hence, it is unclear how lexicalization can produce meanings that enter into core semantic processes. This paper explores how an approach to the lexicon that posits substantial linguistically determined internal structure can resolve this problem. According to this view, concepts enter into lexical items only as lexical roots. These roots can be *packaged* in ways that enable composition, even if the root concepts themselves cannot directly enter into truth-conditional composition. The paper illustrates this with examples from the domains of causative verbs and gradable adjectives.

The approach to the lexicon that this paper supposes, which I have labeled the *packaging view*, encapsulates several developments in lexical semantics. One is that lexical entries are highly structured, and include a root, together with a limited range of structural frames that *package* the root to form a lexical item (e.g. Rappaport Hovav and Levin 1998). (Alternatively, we could see such structure as projected in syntax (e.g. Hale and Keyser 1993).) Lexicalization maps concepts to roots, as I have argued in other work (cf. Pietroski 2010, 2012). In particular, lexicalization maps concepts drawn from extra-linguistic cognitive domains to positions in distinctively linguistic structures (presumably determined by the language faculty). However, roots are linguistically atomic (Grimshaw 2005), and show no substantial linguistic structure of their own. Building on my earlier work, this paper captures this phenomenon by treating roots as *pointers* from within the language faculty to extra-linguistic concepts.

To illustrate this, consider the much-discussed case of causative verbs. Following Rappaport Hovav and Levin (among others), I treat these as having lexical entries of the form $[[x \text{ ACT}] \text{ CAUSE} [\text{BECOME} [y \langle \text{STATE} \rangle]]]$, where *STATE* marks the position of the root, lexicalized as a stative predicate providing a result state. Hence, for instance, we have a form of the classic analysis of *kill* as ‘cause to become dead’, i.e. $[[x \text{ ACT}] \text{ CAUSE} [\text{BECOME} [y \langle \text{DEAD} \rangle]]]$ with stative root *DEAD*.

The concept of death is lexicalized by this entry. Conveniently, a great deal is known about this concept in the psychology literature, from Piaget onward. Young children represent some forms of biological concepts, and mature concepts of life and death emerge by around age 10 (Carey 1985, Slaughter, Jaakkola, and Carey 1999). Though the issue is contentious, it is plausible enough that

an extra-linguistic concept of death could be mapped to a root in forming the lexical entry for *kill*. However, the same psychology literature indicates that the concept of death is likely represented cognitively as a *theory*, as are many core biological concepts. Such theories relate multiple concepts and involve laws and explanatory mechanisms (e.g. Carey 1985, Gopnik and Meltzoff 1997). In the particular case of death, it is a common idea that the concept involves the cessation of bodily processes and the end of life (Carey 1985, Slaughter, Jaakkola, and Carey 1999).

The root in a causative verb enters into semantic composition as a stative predicate of individuals, allowing [y $\langle DEAD \rangle$] to compose as $DEAD(y)$, but a theory does not have the structure to do this directly. To do so requires an extension, but it is doubtful that the theories represented cognitively have the power to fully determine extensions. Evidence from the developmental literature makes this vivid for concepts like death, but it is a general feature of theories that they can be only partial determinants of the extensions of their terms. Furthermore, the psychological evidence I am aware of does not seem to indicate that the concept is represented as stative, as death is linked to biological processes. (The data I am aware of does not seem to probe for stativity.)

The packaging view, which treats roots as linguistically atomic pointers, is not challenged by these facts. Roots are marked for category (state, thing, etc., cf. Jackendoff 1990), which determines what semantic type they may be, but otherwise they serve as pointers to concepts. These pointers need not reflect the internal structure by which the concepts are represented cognitively. For purposes of semantic composition, they may simply function as variables of the appropriate semantic type. In the daily practice of doing compositional semantics, this is how roots are treated, and the packaging view holds that the practice is in fact correct.

According to this view, the concept lexicalized will impact truth-conditional semantics by providing a range of *constraints* on the value the variable can take. A theory is a very good structure for providing such constraints, but other structures that may encode concepts can be as well. Thus, semantic composition and conceptual representation do not pose a problem according to the packaging view. But, there are several consequences of this proposal. First, the mapping of a root to a concept is non-trivial (as other work on lexicalization also suggests, e.g. Pinker 1989). For instance, in our case, we select a stative root, but map to a theory which is (as best as we know) not specifically about a state. So, the mapping would roughly express ‘state of death as constrained by cognitively represented theory D ’. Second, the proposal has the consequence that linguistically encoded meaning may only be a partial determinant of truth conditions. (I have defended this conclusion in other work.)

These results are not specific to verbal domains. For instance, similar results can be obtained for gradable adjectives. According to a widely held view, gradable adjectives are degree functions, mapping individuals to degrees on a scale. The scale is an ordered set of points, with a *dimension* that specifies what the points are degrees of (e.g. Kennedy 1997). So, the semantic value of *tall* is a function from D_e to $S_{\text{tall}} = \langle D_{\delta_{\text{tall}}}, <_{\delta_{\text{tall}}} \rangle$. The order structure of the scale seems to be substantially linguistically determined. (There is some evidence that the orderings used in lexical entries may be highly restricted, and may always be dense linear orderings (Fox and Hackl 2006).) The lexical root is the dimension δ_{tall} , as I have argued in other work. Here again, we can observe that the root can be treated as atomic for purposes of semantic composition. Composition runs off the points on the scale and their ordering, and makes no specific reference to the dimension. As with the previous case, the root only serves to constrain the nature of the degree function, and so, can be seen as restricting the values a variable of appropriate type can take.

As before, it is a natural hypothesis that the root is a pointer to an extra-linguistic concept, such as a concept of height or weight which might serve to restrict the range of a degree function variable. Again, there is some evidence from the psychology literature about how the relevant root concepts are represented cognitively. Carey (1991) argues that the concept of weight is represented

as a theory, much as the concepts of life and death are. In this case, the concept is part of our understanding of a range of concepts relating to matter. This may provide a plausible root concept for the adjective *heavy*, for instance. As before, the root concept would provide a theory which constrains what a degree function could be like, by requiring it to map individuals to values representing weight according to the theory. There are other alternatives. There is some evidence that the concept of height lexicalized in *tall* may involve exemplars as much as a theory (Keil and Carroll 1980). But these also can provide constraints on the value a function variable can take.

These examples illustrate the conclusion that the view of the lexicon involving the packaging of pointers can render truth-conditional semantic composition and various psychologically plausible representations of extra-linguistic concepts compatible.