Lexical Meaning, Concepts, and the Metasemantics of Predicates*

Michael Glanzberg
Northwestern University

In this essay, I shall examine how concepts relate to lexical meanings. My main focus will be on how we can appeal to concepts to give specific, cognitively rich contents to lexical entries, while at the same time using standard methods of compositional semantics. This is a problem, as those methods assume lexical meanings provide extensions, while concepts are mental representations that have very different structure from an extension. I shall propose a way to solve this problem, that casts concepts in a *metasemantic* role for certain expressions; notably verbs, but more generally, expressions that function as content-giving predicates in a sentence.

To offer my solution to this problem, I shall present a general view of how concepts and lexical entries relate that I have discussed elsewhere (Glanzberg, 2011, 2014). This view takes as its starting point some common assumptions in lexical semantics about how lexical entries are structured, and uses them to show how lexical entries can contain *pointers* to extra-linguistic concepts. In advancing my proposed solution here, I shall refine the idea of a pointer, and show that lexical entries contain variables whose values are set by concepts. This relation, I shall argue, is best thought of as a metasemantic one.

*Versions of this paper were presented at Semantics and Philosophy in Europe 7, Zentrum für Allgemeine Sprachwissenschaft, Berlin, June 2014, the 26th European Summer School in Logic, Language and Information, Tübingen, August 2014, and the Department of Cognitive Science, Johns Hopkins University, February 2015. Thanks to all the participants at those events for valuable comments and discussions. Thanks also to Fabrizio Cariani, Bridget Copley, Magdalena Kaufmann, Stefan Kaufmann, Daniel Lassiter, Paul Pietroski, and Ede Zimmermann for many helpful discussions of the ideas in this paper. Special thanks to Derek Ball, Lance Rips, and Alexis Wellwood for comments on earlier drafts of this paper. And very special thanks again to Lance Rips for guiding me through many issues in cognitive psychology.

My main goal here is to solve a particular problem about how concepts can enter into semantic composition. But along the way, I shall also consider the broader question of how rich, and how closely tied to cognition, a lexical meaning should be. Philosophers, linguists, and psychologists have offered many different views on this, ranging from those that make lexical meanings just the concepts we might possess, to those that make lexical meanings just extensions, devoid of any cognitive significance. The proposal I shall offer allows us to have it both ways. It shows how we can see lexical meanings as importantly fixed by concepts, but at the same time, not having the internal structure of concepts, and having fully extensional and compositional properties. This, I shall argue, provides a better account of how concepts, drawn from the wider range of cognition, relate to language-specific lexical meanings. At the end of my discussion here, I shall look briefly at how we might make room for some cases of semantic externalism, while having concepts play this metasemantic role

The plan for this paper is as follows. In section 1, I discuss how familiar approaches to compositional semantics often provide uninformative lexical meanings. I review considerations favoring such approaches, that indicate ways lexical meanings might be cognitively thin. In section 2, I turn to reasons to think lexical meanings are closely linked to concepts, though this raises the problem of how they can enter into standard processes of semantic composition. I begin to build a solution to this problem in section 3. I review some ideas about how lexical entries are structured, and show how concepts can be linked to lexical roots in structured lexical entries. I develop this approach further in section 4. I show how lexical roots can be treated as variables, whose values are set by concepts. This allows roots to enter into semantic composition. In section 5, I show how this casts concepts in a metasemantic role, and how it helps to balance the considerations in favor of cognitively thin lexical meanings with those in favor of close connections between lexical meanings and concepts. I also consider how there might be room for semantic externalism on the approach I advocate. I conclude briefly in section 6.

1 Composition and Lexical Meaning

One of the great accomplishments of semantics over the past 80 odd years has been to understand much of how semantic composition works. Indeed,

this is one of the hallmarks of what is sometimes called 'formal semantics', or sometimes even 'compositional semantics'. It is also sometimes called 'truth-conditional semantics', and that is important for the main issue of this paper. Though there remain some open questions about how composition works, both in foundations and in details, there is one important overarching insight: truth conditions, and contributions of phrases to truth conditions, enter easily into well-understood composition mechanisms. When we approach semantics truth-conditionally, semantic composition works smoothly and easily.[1]

The point here is entirely familiar. To remind us how semantic composition typically works consider the sorts of things we see now in many papers and textbooks, like:[2]

(1) a. $[\![\text{smokes}]\!] = \lambda x.x$ smokes
    b. $[\![\text{Ann}]\!] = \text{Ann}$

(2) $[\![\text{Ann Smokes}]\!] = [\![\text{smokes}]\!]([\![\text{Ann}]\!])$

This happens to be composition by function application, which generalizes to a large number of cases. Like many others, I myself doubt it is the only form of composition there is, but it is a central case, and it illustrates how simple composition can be in truth-conditional semantics.[3] In truth-conditional semantic theories, composition just works.

[1]Of course, I am talking about the project started with Tarski (1935), developed by Carnap (1947), Cresswell (1973), Davidson (1967), Lewis (1970), and Montague (1973), and then many others. There are currently textbooks where you can find overviews of some of the flavors of truth-conditional semantics, by Chierchia & McConnell-Ginet (2000), Heim & Kratzer (1998), and Larson & Segal (1995). There remains some debate about options for composition mechanisms. Much semantics currently follows the Fregean and Montagovian tradition of making it primarily function application, as stressed in e.g. the type-driven approach of Klein & Sag (1985). The other option, identified with the neo-Davidsonian tradition, puts more weight on thematic rules and conjunction (e.g. Higginbotham, 1985; Pietroski, 2002). I shall use the type-driven approach as my main example, though I doubt all that much of what I argue here depends on the choice.

[2]Here I mostly follow the influential presentation of Heim & Kratzer (1998), though up to some notational details, you find something similar in many many works in semantics. Semantic values are indicated by double brackets $[\![\cdot]\!]$. In displays and formulas, I let context disambiguate use and mention, but where it is helpful, I put linguistic items in *italics*. Thus, $[\![\text{Ann}]\!]$ is the semantic value of *Ann*.

[3]For some interesting comments on the likely range of semantic composition principles, see von Fintel & Matthewson (2008). In joint work in progress with Jeffrey C. King, we argue in favor of a specific family of composition principles distinct from function application. As I am taking Heim and Kratzer's presentation as an example, it should be noted that they do not limit composition to function application either.

The kinds of meanings given for *smokes* above are common in works focusing on compositional semantics. But, it is obvious that they are somewhat uninformative. The clause '$[\![\text{smokes}]\!] = \lambda x.x$ smokes' sheds little (though not zero!) light on the meaning of *smokes*. It represents features of its argument structure. It also states its extension, which is an important feature of meaning, no doubt. But for all that, there is something theoretically lacking in this kind of clause. It states the extension in a way that is theoretically uninformative, and fails to explain much of anything about the meaning. This has been the subject of much discussion, and I shall not revisit it here, except to note that if you are really interested in lexical semantics (i.e. analyzing meanings in the major lexical categories), and are interested in theoretically robust explanations of how lexical meaning works, you should not find the clause for *smokes* to be adequate as it stands.[4]

Providing an extension for a predicate, or in intensional settings an intension, etc., works perfectly for semantic composition. This is important, as having semantic composition work easily is one of the great advantages of truth-conditional semantics. But when it comes to explaining lexical meaning, simply providing an extension in the way we did for *smokes* is theoretically less than satisfying.

Here we see a significant split over whether this is a problem, and if so, how to respond to it. There is a temptation, embraced by some theorists, to think that what is left out in (1) has something to do with concepts. After all, we seem to want to link lexical meanings to cognitively richer representations than these simple statements of extensions provide, and concepts offer a very natural way to do so. More than a temptation, this is a serious theoretical commitment of a number of approaches to lexical semantics, as I shall discuss more in the next section.

On the other hand, some theorists conclude that there is not really a problem here, and that we simply see that semantic content is less rich than some might have expected it to be. Indeed, many theorists had independent reasons to expect lexical meanings to be little more than extensions to begin with. The most striking form of this view, of course, is direct reference theory. As is very familiar, direct reference holds that the semantic content of many terms—often proper names, demonstratives, or indexicals—are just their bearers. Part of the point of such theories is to separate meanings

[4]For discussion of this issue, see my (2014) and Borg (2012) and Higginbotham (1989), as well as the classic discussions by Dummett (1975) and McDowell (1987).

from any descriptions an agent might have of an object, or any other kind of cognitive representation they might have. As Salmon (e.g. Salmon, 2005b) and Soames (e.g. Soames, 2002) put it, semantic content for direct reference theorists is 'non-descriptional'. Though we do not always think of concepts as descriptions these days, the point still applies: the whole idea is to separate the semantic content from anything like a concept at all.

For singular terms, especially proper names, this is commonplace. Following the lead of Kripke (1980) and Putnam (1975a), direct reference theorists have sought to extend the view to at least some predicates. With Putnam, they usually take natural kind terms like *gold* or *tiger* (appearing as nouns) to refer to kinds, taken as abstract things. Various direct reference theorists have considered extending the idea to terms for phenomena like *heat* or magnitude terms like *energy*, to adjectives like *red* or *loud*, and to verbs including *grow*. There are a number of technical complications for these proposals that direct reference theorists have explored over the years. We will not need to dwell on the details here. Rather, I merely note that the model of direct reference might be applied to at least some predicates, and that the idea has been taken up in earnest by some theorists.[5]

Direct references theories represent one line of thinking about meaning, which seeks to remove concepts, or any kinds of mental representation or descriptions believed by speakers, from the semantic content of expressions. Let us call meanings that downplay the role of any mental representations of speakers *cognitively thin*. Direct reference then takes the strong position that for many expressions, meanings are maximally thin. At least some predicates, according to direct reference theories, likewise maximally thin.

Direct reference theory is one clear source of cognitively thin semantics, but it is far from the only one. Semantic externalism provides another sort of motivation. Famously, Putnam (1975a, p. 227) concluded, "Cut the pie any way you like, 'meanings' just aint in the *head*!" If we were to think

[5]See the extensive discussions in Salmon (2005b) and Soames (2002), and Salmon's reply to Soames (Salmon, 2005a). See also the classic discussions of Donnellan (1973) and Kaplan (1973). Specifically, Kripke and Putnam both propose extending the model to color adjectives, Kripke proposes extending it to natural phenomenon terms and other adjectives, and Putnam to magnitudes and some verbs. All these suggestions are for ways the view might be extended, and not fully worked out analyses. In a related vein, Ben-Yami (2001) has proposed treating kind terms as plural referring expressions. See also the reply by Contessa (2007). For a view that generally disassociated semantics and cognition, see Soames (1989).

that the meaning of a word is a concept, then by any understanding, we would go against Putnam's dictum. More pressing, however we come down on the general issue of semantic externalism, the arguments Putnam and others have offered raise some specific challenges for the idea that meanings are concepts. Putnam offers cases, focusing on natural kinds, where the descriptions speakers might believe do not fix the correct extension for the kind. We need something from the external environment, not a concept or anything else about the speaker's mental states to do so. Modern theories of concepts often do not invoke descriptions meant to provide necessary and sufficient conditions, but the point still stands, and if anything, can be made more extreme by some approaches to concepts. It is not clear if we can always expect concepts to correctly determine extensions (or intensions) for predicates. This problem arises even if we depart from a strict direct reference approach to the semantic content of predicates.[6]

Though there may be something theoretically unsatisfying about lexical entries that simply provide extensions, we thus also have reasons we might prefer them. As I already mentioned, they easily figure into semantic composition, while as we will see in a moment, concepts do not do this very easily. We have externalist arguments that putting too much weight on cognitive representations can get extensions, and so truth conditions wrong. And we have challenges, perhaps inspired by direct reference theories, to whether cognitive representations like concepts have any place in linguistic meaning to begin with. These points all apply to predicates and other major lexical categories.

In the next section, I shall review some reasons to think that in fact we should see concepts as linked to lexical meanings, especially for verbs and other predicates. I shall go on to present a way of doing so that answers the challenges we have seen here, by using concepts in the metasemantics of predicates. I shall concentrate mostly on the issue of semantic composition, and how we can connect concepts to lexical entries in a way that allows us to retain standard modes of semantic composition. I shall then, more briefly, address concerns about externalism, and general questions about how much cognitive content we should allow into linguistic meaning.

[6]Of course, this issue is one of many that externalism raises, and does not engage many of the subtleties of how we might think of content externalism relating to semantic externalism. I shall not explore these issues here; see the survey of Wikforss (2007) for a good discussion and many references. I am also not here exploring issues of anti-individualism and semantic competence (see Burge, 1979, 1989; Higginbotham, 1989).

2 Words and Concepts

In this section, I shall develop the idea that word meanings are closely related to concepts, and explain more fully the issue this raises for compositional semantics. But first, I should pause to specify what I mean by 'concept'. I shall follow the standard approach in philosophy of mind and cognitive psychology, and assume that concepts are mental representations. They are units that are active in thinking, and contribute content to cognitive states. As such, they are part of our cognitive repertoire.[7]

Current research on concepts, mostly from cognitive science, considers a range of different kinds of conceptual representations, each of which offers a view of the nature of concepts.[8] For instance, prototype views, stemming from work of Rosch (e.g. Hampton, 1979, 1993; Prinz, 2002; Rosch, 1978; Rosch & Mervis, 1975; Smith & Medin, 1981) think of concepts as prototypes, comprised of features. For the concept BIRD, for instance, we might expect *fly*, *wings*, *feathers*, etc. Features are *weighted*, which is important for explaining empirical results about *typicality* effects. Categorization is done by applying some *similarity metric* that compares weighted features of something be categorized with the prototype. Importantly, this gives concepts a *graded* or *probabilistic* nature.

There are a number of different approaches to concepts in the current literature, and I shall not try to choose between them, except to follow current research where it suggests some particular way of representing some particular concept. Related to prototype views are examplar views, where individual examples of what falls under concept, rather than features, are stored in memory (Medin & Schaffer, 1978; Nosofsky, 1986, 1992). Somewhat different, in certain respects, are theory views (e.g. Carey, 1985, 2009; Gopnik & Meltzoff, 1997; Keil, 1989; Murphy & Medin, 1985; Rips, 1989). This approach sees concepts as mental theories. The theories are often described as 'mini-theories' (Rips, 2011), as they are limited in scope. They often represent people's ideas about what makes something fall under a con-

[7]For surveys of concepts and references to the very large literature, see Laurence & Margolis (1999), Murphy (2002), Rips (2011), and Rips et al. (2012). For an interesting abstract perspective, see Markman (1999). For some developments in the formal modeling of concepts, see the papers in Pothos & Wills (2011).

[8]Again, see the surveys by Laurence & Margolis (1999) and Murphy (2002). Standard notion is to put concept terms in capital letters, so BIRD is the concept which includes robins and sparrows.

cept and say something about what the normal properties of those things are. They can involve laws or explanatory mechanisms, or relate multiple concepts. Of course, these are barely gestures towards some complex views, and there have been many updates and modifications to them over the years. (The references in footnote 7 indicate some of these.) But this brief gesture will be enough to introduce how cognitive psychology sees concepts.

There is one point that will be especially relevant as we go forward. Concepts are mental representations, but they (typically) characterize real-world things. As sometimes put, concepts determine *categories* of things. I shall reserve 'category' for the collection of things categorized together by a concept, and 'concept' for the mental representation itself. This terminology is reasonably commonplace, though not always observed strictly. It should be stressed though, that when psychologists talk about categories, it is often linked to behavior, i.e. how agents will categorize objects, according to some concepts.[9] How concepts—mental representations—can fix categories, and how this relates to extensions, has been the focus of philosophy more than psychology (e.g. narrow content, long-arm versus two-factor theories, etc.).[10] I shall assume concepts do fix categories somehow, and shall not dwell on how they do so. I shall return to some issues about how this relates to extensions when we reconsider externalism in section 5.

With this brief gesture toward theories of concepts, we can get back to the main point. Faced with an unsatisfying lexicon in textbook-standard truth-conditional semantic theories, there is a great temptation to think that appeal to concepts might be the right way to enrich the lexicon. To many, this seems like a natural idea. After all, concepts seem to provide just the kinds of richer representations of content that our extensions do not. To many, especially in psychology and psycholinguistics, a natural starting point for research is the idea that a word is essentially a pairing of a concept with a sound (and a syntactic category, and morphology, etc.). This makes a concept for all intents and purposes the meaning of the word. After all, as is often noted, words have some pretty obvious connections to thought, and when we communicate with words, we often do so to affect thought (e.g. Murphy, 2002). If concepts are units of thought, it is then overwhelmingly

[9]Hence, these are not the extensions semantic externalists might expect in some cases; though see the discussion in section 5.

[10]Though, from a psychological perspective, see Malt (1991). The philosophy literature is too voluminous to cite briefly. See instead the many references in Brown (2011) and Lau & Deutsch (2014).

tempting to think they are also the meanings of the words we use to convey thoughts.

In addition to intuitive appeal and conceptual arguments, there is also a substantial body of data indicating close connections between word meanings and concepts. Surveys like those by Murphy (1991, 2002) or Vigliocco & Vinson (2007) all list a variety of sorts of data, including priming and typicality effects, imaging data, and so on. Numerous studies of word learning rely on associations with concepts in various ways (e.g. Bloom, 2000; Clark, 1983). I shall not go into the details, as others have done that very well. I simply pause to note that the idea that word meanings and concepts share a close connection is backed up by real data. Lots of it.

Of couse, like all data pertaining to something as complex as the human mind, this data can be complicated, and there is also evidence that the connection between words and concept is not simple. One of those same surveys (Vigliocco & Vinson, 2007) notes cases where impairments in linguistic tasks have been observed without impairments in conceptually related non-verbal tasks. As stressed by Murphy (2002), phenomena of polysemy, together with the wide range of concepts an agent might store, raise some complicated questions about how to map words—or more specifically, phonological shapes—to concepts. These sorts of findings tell us that the mapping from words to concepts must be more complex than the most simple options would provide. Nonetheless, both empirical research and theoretical considerations still points to a strong link between word meaning and concepts.

We thus have strong grounds, both theoretical and empirical, to associate words with concepts, and also some evidence that the way that association is established may be complicated. In sections to follow, I shall describe the way I think that association is made. It will be somewhat indirect, establishing a link between word meanings and cognitively rich concepts, but not making them identical. That, as I mentioned, will help address issues of composition, and help balance the pressures to relate word meanings to concepts with pressures toward cognitively thin meanings.

The arguments for cognitively thin theories, like direct reference theory, focus mainly on such expressions as names, demonstratives, and so on, though as I mentioned, there are proposal to extend them more widely. The evidence I mentioned that strongly suggests links between lexical meanings and concepts is, for the most part, drawn from studies and theoretical considerations relating to verbs and nouns—core lexical categories. It is thus open to hold direct reference theories for e.g. demonstratives and names, but

a view of nouns and verbs that links them to concepts. Kind terms, of course, are a point of overlap between concept-oriented theories and cognitively thin theories, and will raise special issues. But generally, I do suspect that the evidence relating lexical meanings to concepts is a reason not to extend extreme cognitively thin theories, like direct reference theory, to lexical categories in full. The proposal I shall offer does allow some of the virtues of cognitively thin theories, though it is no doubt not in the spirit of direct reference. This, I shall argue, is the right result, allowing us to account for evidence both for and against concept-oriented accounts of meaning for lexical categories.

Before getting to these issues, I shall focus on how concepts can enter into semantic composition. We are now in a position to sharpen the problem here. We saw above in section 1 how standard truth-conditional theories easily provide for semantic composition, in the form of function-argument composition, and perhaps a few more forms. These rely on extensions to compose in familiar functional ways (or intensions, of course). Concepts, we have now seen more clearly, are not the sorts of things that enter into these kinds of semantic processes, quite generally. We have seen a number of proposals about what sorts of mental representations concepts might be: prototypes, examplars, theories, etc. But none of these are the sorts of things that enter into standard forms of semantic composition. A structure of examplars or prototypes, perhaps with a similarity metric, is just not the kind of thing that enters into function-argument composition, or any of the other forms of composition common in semantics. The same goes for theories, or more abstract ways of modeling these mental representations. This is the problem to which I shall propose a solution soon.

To stress, this is a somewhat different problem than the much-discussed one of how concepts can compose with each-other.[11] That is a problem, and an interesting one. But it is a different problem. That one takes two concepts and tries to combine them in a way appropriate for concepts; whereas my concern here is how a concept can enter into semantic composition as we know it.

To address the problem about concepts and composition, and issues about how cognitively rich the content of predicates should be, we need to turn to some ideas about the lexical semantics of predicates. It is to these we now

[11] As discussed e.g. by Fodor & Lepore (1996) and Osherson & Smith (1981), a typical pet fish is not a typical fish or a typical pet. There has been a great deal of work on how concepts might combine, e.g. Hampton (1991); Prinz (2012); Smith et al. (1988). See Rips (2011) for a survey.

turn.

3 Structure and Concepts in the Lexicon

I shall in this section review some ideas about how lexical entries are structured, and discuss where concepts might relate to such structured lexical entries. This will form the basis for an explanation of how concepts relate to word meanings, which I shall use to try to solve the various problems we have seen.

The meanings of words in the major lexical categories (nouns, verbs, adjectives), according to most current approaches in lexical semantics, are complicated. According to many approaches, in particular, lexical entries for these sorts of words are highly *structured* entities. This has been most extensively explored for verbs. Here is a good illustration, using a lexical entry for the verb *open*:

(3) a. open
    b. [[x ACT] CAUSE [BECOME [y $\langle$*OPEN*$\rangle$]]]

This specific structure follows Levin and Rappaport Hovav (Levin & Rappaport Hovav, 1995, 2005; Rappaport Hovav & Levin, 1998), but many different theories posit some such kind of structure (e.g. Bierwisch & Schreuder, 1992; Pinker, 1989; Jackendoff, 1990; Wunderlich, 1997). This is an example of lexical decomposition. This particular one is event-oriented, and decomposes the causative verb *open* into a complex description of related events.

There are many linguistic reasons for positing such internal structure. It helps to explain how lexical items group into linguistically significant classes; it helps to explain what entailments words in those classes show; and it helps to explain how syntax and semantics interact, especially, how predicates project their arguments in syntax. It is surely a non-trivial assumption that lexical entries are structured, but it is one that has received enough discussion in the recent literature that I shall take it for granted.[12] Though the details

[12]Of course, there are objections, such as those from Fodor (1998); Fodor & Lepore (1999); Cappelen & Lepore (2005). For rejoinders, see Collins (2011) or Johnson (2004). There is also an alternative highly influential approach that puts structure not in the lexicon proper, but in syntax, such as Hale & Keyser (1993, 2002) or Borer (2005). There are significant empirical and theoretical differences between approaches that put structure in the lexicon or syntax, but as will become clear as we proceed, I can work with either view.

will not matter, I shall continue to take the influential Levin and Rappaport Hovav approach as my example of how lexical entries are structured.[13]

The example of the decomposition of a causative verb shows the features of the lexicon that will be important as we go forward. Lexical decomposition provides what I like to call *packaging* within the lexicon. In our example, we start with a root element *OPEN*. But that does not by itself tell you what the verb means. The root here is a state, so it does not even offer the content of a causative.[14] The decomposition puts the root element in a structural frame, in our example built out of the elements CAUSE, BECOME, and ACT. The familiar story from lexical semantics is that there is a highly limited range of such structural elements, and they are responsible for the grammatically significant aspects of the expression. For instance, the frame exhibited above built from CAUSE, BECOME, and ACT characterizes causatives (or in Levin and Rappaport Hovav's taxonomy, an 'externally caused change of state'). Families of lexical entailments are expected to follow from the structural frame that packages a root, as are the ways the expression projects arguments.

What will be important for us going forward is that the packaging part of a lexical entry is distinctively linguistic. It is built from a small number of linguistically distinct primitives, and explains the linguistically significant aspects of the entry. It should be no surprise that most of the work in lexical semantics within linguistics focuses on the packaging.

What about the roots? These are elements like *OPEN* in the sample lexical entry above? These are certainly important, as they give each expression its distinctive meaning. For instance, there are a huge number of causative verbs that fit the structural frame illustrated above. They each mean something different, because they package a different root in that same frame.[15]

[13]I am here using Levin and Rappaport Hovav's notation, though as this is just an example of how a lexical entry may be structured, I shall not put too much weight on that notation. As we shall discuss more in a moment, they put structural elements, like CAUSE in capitals, and root elements like *OPEN* in capital italics. Though this is mere notation, it is evocative of the notation for concepts. Of course, what the connections between these components of a lexical entry and concepts really are is precisely what we are exploring here.

[14]It is interesting, and probably important, that causatives seem to involve stative roots. See the discussion in Pietroski (2010, 2012), and some remarks in my (2011).

[15]The term 'root' is used in a number of ways. There is a customary use in morphology that is different than the one here (Aronoff, 1994). The term 'root' for lexical roots is

Roots, however, function (almost) atomically as far as grammar is concerned (cf. Grimshaw, 2005). The grammatically significant properties of a lexical entry are determined by its packaging, with virtually no contribution from the root element.[16]

Combining these two observations, as I have argued elsewhere (Glanzberg, 2011, 2014), we may treat roots as the points where concepts enter the lexicon.[17] If each root is linked to a concept, then we can explain how lexical items get their distinctive, idiosyncratic meanings, and how they display the kinds of rich conceptual structure in cognition we discussed in section 2. To account for the atomicity of conceptual structure in grammar, however, it is best to treat roots as *pointers* to concepts. Assume, for a moment, that the lexicon is part of a modular language faculty, and that most concepts that provide root meanings are extra-linguistic; i.e. not part of the language faculty proper. If so, then roots function as cross-module pointers, linking a lexical item in the language faculty to a concept outside of the language faculty.[18] This idea explains why the internal structure of a concept, be it prototype structure, theory structure, or anything else, is not evident linguistically. As all that is within the domain of the language faculty is a (typed) pointer, roots function atomically as far as linguistic structure is concerned.

The lexicon, according to this view, can be described in terms of *pointers* and *packaging*. Following the tradition in lexical semantics, lexical entries have structural frames. These package roots, and thereby determine a range of grammatical and other linguistically encoded features of lexical items. The roots themselves are pointers, that function to link a lexical items to extra-

often attributed to Pesetsky (1995), and is taken up by Levin & Rappaport Hovav (2005).

[16]One qualification here is that roots appear to be typed (though just how finely-grained their typing is remains, I believe, unclear). As we will see, this does help support semantic composition. It is a departure from the claim that roots are linguistically atomic, but not a large one. As far as I know, no significant grammatical fact about a lexical item flows from the type of its root, rather than the nature of the packing in which a root of that type appears.

[17]Though he does not put the point quite the same way, related ideas are discussed by Pietroski (2010, 2012). I am, clearly, much more sanguine about truth-conditional compositional semantics than Pietroski is, and my pointers are not concepts introduced by lexicalization, as Pietroski's 'I-concepts' are. Nonetheless, there are important points of overlap between our views, especially on the cross-module nature of lexical meaning.

[18]Less than a fully modular view of the language faculty is needed to support this sort of picture. Clearly, some domain specificity is required, as we need to make sense of a cross-domain pointer, but other aspects of modules are not crucial. See Collins (2004) for some discussion of these issues.

linguistic concepts. This offers a clean division of labor between distinctively linguistic aspects of cognition and our wider cognitive abilities, and it captures the combination of regular structure and idiosyncrasy we find in the lexicon. As I argued in Glanzberg (2014), it also explains patterns in where we find good explanations in our linguistic theories, answerable to linguistic data, and where we do not.[19]

4 Composition in the Lexicon

According to the pointers and packaging approach, roots act as pointers to concepts. Those concepts are whatever they are, but the evidence suggests they take the form of graded representations, perhaps based on examplars or prototypes; or they may be more like theories. Regardless, as I already mentioned, we have representations that do not naturally enter into the well-understood processes of semantic composition. They do not figure easily into function-argument composition, for instance.

[19]As I mentioned, the general idea of lexical decomposition is adopted quite widely. The particular place that concepts have in the pointers and packaging view I endorse is more distinctive. It differs from the influential 'conceptual semantics' approach due to Jackendoff (e.g. Jackendoff, 1983, 1990, 2011), in several ways. For instance, it does not posit a distinct level of conceptual structure, as conceptual semantics does. Moreover, analyzing a lexical entry is not analyzing a concept, on my approach, as concepts are not even parts of lexical entries. Likewise, lexical entries can be taken to be fully within the language faculty, and not part of a broad interface with cognition. Only roots provide such interfaces, on my view. Perhaps most importantly, as I shall discuss more below, I make many fewer internalist assumptions than Jackendoff does. Concepts are mental representations, but I assume they can have referential properties, and typically determine real-world categories, which can function as extensions. Likewise, as I shall also stress, the pointers and packaging approach is fully embedded in the general project of truth-conditional semantics.

My approach has more affinities with the 'two-level semantics' of Bierwisch, Lang, Wunderlich, and others (e.g. Bierwisch, 1982; Bierwisch & Schreuder, 1992; Lang & Maienborn, 2011). I believe we share similar motivations, and a similar perspective on how language and the rest of cognition connect in the lexicon. We do make some different assumptions. For instance, I do not posit the level of Semantic Form (SF) they do, and we wind up with somewhat different specific divisions between distinctly linguistic and conceptual elements. I have opted for a Levin and Rappaport Hovav-style presentation of structural elements, which differ somewhat from the semantic features of the two-level approach (e.g. Bierwisch, 2011), but this is more for illustration than a firm commitment on my part for what the right inventory of such elements will ultimately be.

But, the way roots function as pointers offers a solution to this problem. Along the way, it will allow me to clarify the notion of a pointer. In short, what roots provide are variables of the right semantic type. The concept to which a root points serves to constrain the value of the variable. In the best cases, it simply sets the value.

Before explaining this let me highlight one more assumption. I assume that the structural elements that form the packaging in the lexicon are already integrated into semantic composition. This is widely assumed (though not always noted by researchers mainly interested in the lexicon itself).

Let me mention one example, which can quickly illustrate the point. Take the BECOME element used in the structural frame of a causative verb above. A simplified version of a common sort of analysis of BECOME looks like:

$$(4) \quad \text{BECOME}(P)(x)(e) = 1 \quad \text{iff} \quad P(x)(\text{init}(e)) = 0 \wedge P(x)(\text{fin}(e)) = 1$$

This sort of analysis stems from Dowty (1979) (and more recently Krifka (1998); Parsons (1990); Rothstein (2004), emphasizing events). It tells us that e is an event of x becoming P if at the initial point of e, x is not P, while at the final point it is. Similar work has been done on CAUSE (Dowty, 1979; Thomason, 2014), though causation has proven an extremely difficult topic, to say the least.[20]

This sort of analysis, or anything like it, places BECOME easily within the scope of familiar compositional semantics. BECOME is a function on events and predicate extensions, and composes with them by function-argument composition. It will interact with other structural elements in whatever ways turn out appropriate. I shall assume that some compositional analyses of structural elements are to be found. As I mentioned, with elements like CAUSE we may not yet possess the final analysis, but it is plausible enough that packaging is compositionally tractable, and amenable to semantic analysis. I shall assume it is.[21]

[20] Again, the philosophy literature is too big to list. See the many references in Paul & Hall (2013).

[21] As a referee notes, there are a number of further questions we might ask about lexical entries and their relations to concepts. I assume, as most do, that lexical entries are stored units that figure into linguistic (syntactic, semantic, phonological, etc.) processes. They are thus, in a wide sense, units of cognition. I hesitate to label them concepts, as these tend to be thought of as representing categories, and I do not think lexical entries do that. (For instance, the syntactic features in a lexical entry do not, on my opinion.) Structural elements that provide packaging, like BECOME, do have contents. As such, it might be reasonable to label them as concepts, as indeed the capital letters notation

If that is so, then our focus returns again to roots. In the above analysis, P is just where the root element figures compositionally. Composition here requires an ordinary predicate P. As we are, for discussion purposes, working in an extensional framework, we expect P to be an extension. But what we are given in decompositions like (3) is a root, like *OPEN*. I glossed this as a pointer to a concept. Concepts, as we saw in section 3, are not the sorts of things that enter into semantic composition, and they are not extensions. They are structures of prototypes or theories, etc. A pointer does not help matters. It points to a concept, but the function of pointing is not so easy to integrate into semantic composition either. So, the concern is how we are to make semantic composition within the lexicon proceed; and moreover, to make it proceed easily, as it is supposed to.

The solution is to treat the root semantically as a variable. In the analysis of BECOME above, we see a variable P just where the root is expected to be. I suggest we take this at face value. A root is then a variable. But as a pointer, its value is set by the concept to which it points. It will be convenient to illustrate this with a slightly different example, where more is known about the concept to which the root points. Ironically, a good example is the much-discussed case of the verb *kill*:[22]

---

seems to suggest. As far as it goes, this is fine. But it is important to my view that they are very different in nature than the concepts that typically provide roots. As I have explored more in other work, they are distinctively linguistic. This is so in several respects. First, as has been often observed, they have slightly different contents than their ordinary counterparts (as Dowty (1979) observed for CAUSE). More importantly for me, their contents are amenable to linguistic analysis. As I discussed more in my (2014), we see this most clearly in the case of functional elements like determiners and tense, which get rich detailed extensional analyses in semantic theory. The example of BECOME reminds us the same goes for structural elements in the lexicon. Hence, these kinds of elements have their contents fully specified by the language faculty. That they are amenable to truth-conditional analysis by ordinary semantic means shows this. They are thus fully part of the language faculty, and we need not look outside the language faculty to fully understand their properties. As best as we can tell, they are not accessed outside the language faculty either. This is very different from the concepts that fix roots, which I have described as extra-linguistic. These do not typically have truth-conditional analyses, and work in ways that are genuinely different from linguistic items. They are thus, as I have put it, genuinely outside the language faculty. There may be some developmental connections between linguistic and extra-linguistic items, though this is not certain. It is an intriguing observation that causation is a concept that both appears in some for very early in development (see e.g. Carey (2009) for some overview), and also appears in another form as a distinctively linguistic element.

[22]Ironically, as Fodor (1970) argued against lexical decomposition using just this exam-

(5) a. kill
b. [[x ACT] CAUSE [BECOME [y $\langle DEAD \rangle$]]]

The structural frame here for a causative is just the same as before. The only difference is that the root has switched to *DEAD*. I shall assume the analysis of BECOME above, and focus on the way the root *DEAD* composes with it. As we saw, what we need in composition is a variable P. Its type is an ordinary predicate of individuals, though as we are building a verb meaning, it is useful to also give it an even argument. Hence, we have a predicate variable $P(x)(e)$. This can compose with BECOME directly.

Having a pointer like *DEAD* simply means having a variable $P(x)(e)$ with a rule that the concept DEAD to which it is linked constrains the value of the variable. But how does a concept do this? The basic idea is that it does by fixing a category, and at least in favorable cases, the category simply is the needed extension for the variable. So, we might expect $P(x)(e)$ iff x is in the category fixed by DEAD at the specified point in e. Semantically, a root is a variable, but with a constraint on how its value is set.

The important feature of this proposal is that it allows a concept to contribute to the meaning of a lexical item, without the structure of the concept itself needing to figure into semantic composition. The concept fixes the value of a variable, but the variable is of an ordinary semantic type, and easily enters into semantic composition. So, when we have a concept that can function to set the value of a variable, the pointers and packaging approach works around the problems of how to make concepts enter into compositional semantics.

Are concepts really able to do the job of fixing values of variables? In favorable cases, they can. In such cases, the category fixed by a concept will simply be the extension assigned to the variable. The root concept DEAD provides a good example of how this works. It is no surprise that psychologists have studied the concept of DEATH extensively, and from Piaget onwards, developmental psychologists have studied how children represent death. (I follow Carey (1985); Slaughter et al. (1999). See references therein.) We know that young children represent some forms of biological concepts. The mature concepts of life and death emerge by around age 10. In this case, the concepts can be represented as a kind of *theory*. Its components include:

---

ple. Changes in the details of how lexical decomposition works over the years has made for much more robust analyses. See, for instance, Harley (2012) for more discussion.

(6) a. Applies only to living things.
b. Irreversibility.
c. Cessation of bodily function. Biological.
d. Inevitability. Part of life cycle.
e. Caused by breakdown of bodily function.

Some of these elements are made most vivid by comparison with the concepts of younger children. At certain points, for instance, younger children treat death as a being in some other place or state, and so not fully incorporating irreversibility. Young children's concept of death also involves a significant behavioral component, relating to lack of motion. So, young children have difficulty applying the concept to plants, and seem to miss the idea of cessation of bodily function (e.g. Nguyen & Gelman, 2002).

Theories may not be the right things to enter into function-argument composition, but they are well suited to determining categories. The theory constrains what falls in the category, in the obvious way, by telling us what those things have to be like. Something x is dead iff x was living and has irreversibly ceased bodily function, etc. What is striking, in this case, is that the theory seems to do the job perfectly. Up to some hard cases that biologists themselves tend to have trouble categorizing (virus, prions, etc.), the theory that provides our mental representation fixes the right category of dead things. That category is just the class of dead things. That then figures as the value of a variable P in semantic composition. We thus get the extension we need, by way of a concept which is not itself in the form of an extension.

I mentioned in section 2 that I would assume that (somehow) concepts determine categories. The importance of this assumption should now be clear. Categories are grouping of appropriately related objects, and so are reasonable candidates to be extensions, in favorable cases. In the case of DEATH, I have followed a number of authors (e.g. Carey, 1985; Slaughter et al., 1999) in representing the concept of death as a theory. This example illustrates the favorable case nicely, as it shows how natural it is for a concept (in the form of a theory) to fix a category that appears to provide a correct extension. But the moral, that in favorable cases a concept determines a category which can fix the value of a variable, is not specific to theory-like representations. A collection of features providing a prototype would do equally well. The extension would be the things having the features, or a sufficient number of them. Likewise for other approaches to concepts. The general point is that

whatever the internal structure of a mental representation is, we do not need to put that structure in the lexicon for the concept to play a role in fixing the content of a word. This is the main payoff of the pointers view.

I have repeatedly described the situation we see with the root concept DEATH as a favorable case. It is favorable because it is a case where the mental representation seems able to accurately determine an extension for a root variable. But it is not at all clear that most concepts will be able to do this fully. At the very least, many concepts show typicality effects, which in turn might lead to categories with graded structure rather than standard extensions. To give one familiar example, if we start with a concept like BIRD, we may find it fails to clearly categorize penguins one way or another.[23]

There are a number of ways we might try to address this issue. First, we might ask if some expressions might simply wind up with some graded structure in their meanings, inherited from the ways their root variables are fixed. If so, we will have to find a way to incorporate those into composition. We still get a substantial payoff from the pointers proposal. It would not be the structure of the concept (still examplars, prototypes, etc.) that would have to be incorporated; rather, it would be a graded or partial category which would be incorporated as a graded or partial extension. Fortunately, we have a lot of practice working with graded or partial extensions. The literature on vagueness has shown a number of approaches to doing so: degree theories, many-valued logics, supervaluations, partial predicate theories, and so on.[24] Though many of these call for modifications of composition principles, the basic structure of function-argument composition is preserved. Graded or partial extensions pose substantial problems, but they do figure into reasonably well-understood semantic composition processes. I do not want to minimize the challenges this issue still poses: finding the right way to work with graded extensions that track the structure of graded categories remains a very difficult task. But, it is not a task that undermines our basic grip on semantic composition, and so, I believe, the pointers proposal makes progress in understanding how concepts enter into semantic composition, even with that task still to be accomplished.

There are other options we might consider, which would lead to non-

[23]See again the discussion and references in section 2.

[24]For overviews of these techniques, see the papers in Keefe & Smith (1997) or the review in Williamson (1994). For a discussion oriented towards concepts, see Kamp & Partee (1995).

graded classical extensions being fixed, at least on occasions of use. If, for instance, we expect a concept to provide a similarity metric, we could ask context to provide a cut-off point for membership in terms of that metric.

We could also ask context to help fix values in other ways. One such option might be to work with richer locally constructed concepts, perhaps like the ad hoc concepts discussed by Barsalou (1983, 1987, 1991).[25] I am skeptical of this option, as the point, as I see it, is to capture stable lexical meanings rather than the many things we can do with those meanings in the course of communication. But it is, nonetheless, an option.

There are issues here both technical and foundational. As I mentioned, we may wind up with partial or graded extensions, and face technical issues of how to work with them. We have a number of options at our disposal for doing so, but may seek to refine them for purposes of tracking categories. If we expect context to resolve graded categories into non-graded extensions, we would have to explain how to model that kind of effect. If we expect ad hoc concepts to provide the right categories, we would have to explain how and why. We also face some very fundamental questions about how our thoughts are able to divide the world into categories, and how sharply delineated those categories are. Noting these issues, I shall leave them to other occasions.

In light of uncertainty about just how extension will be fixed in less-than-favorable cases, I have put the proposal that a concept contrains the value of a root variable. In favorable cases, I noted, it seems to fix the value, and in those cases, it seemed safe to simply propose that something falls in the extension if and only if it is in the category fixed by the concept. But more cautiously, we should require only the sufficient condition that if something falls determinately in a category, it is then in the extension. We might reinstate a stronger condition with the right modifications for graded categories, but I shall leave the official proposal the weaker one of a constraint on the value of a variable.

To conclude this section, let us look at the idea of a pointer one more time. In a lexical entry, we find a root. As we saw above, roots are typed. They might also be marked in other ways, perhaps selecting for categories like state, thing, etc. (cf. Jackendoff, 1990). Otherwise they are linguistically atomic. My proposal is that roots are variables, which are mapped to concepts which

[25]This idea has been taken up by the relevance-theoretic literature as well, e.g. Wilson & Carston (2007) and references therein.

function to constrain the values of those variables. This makes them pointers. As such, roots need not, and generally will not, reflect the internal structure by which concepts are represented cognitively. For semantic purposes, they thus function only as variables of the right type, and so, they appear as atomic.

This view accords well with the daily practice of doing compositional semantics. For most purposes, up to issues of typing or some selectional restrictions, we do treat roots simply as variables. We pass the job of explaining how they are fixed off to some other domain. In cases like the one we looked at, the appropriate domain seems to be that of cognitive psychology. The pointers view explains, I suggest, why this daily practice is really correct.

5 Metasemantics and Externalism

To explore this proposal further, I shall return to some of the issues surrounding externalism, and the idea that meanings should be cognitively thin, that we discussed in section 1. In preceding sections, we have seen reasons both for and against treating lexical meaning for predicates, specifically verbs, as cognitively thin. On the one hand, semantic composition runs off extensions, intensions, and so on, which are indeed cognitively thin. Likewise, the evidence currently suggests that the internal structure of mental representation is not the right kind of structure for semantic composition, and does not square easily with the project of truth-conditional semantics. Making meaning cognitively thin avoids those many problems. On the other hand, both theoretical, intuitive, and data-driven considerations indicate strong connections between meanings and concepts, as we reviewed briefly in section 2. And, we might add, in the case of causative verbs we looked at in detail, the role of concepts in fixing meanings seems natural. Unlike the main cases on which direct reference and related theories have focused, like names or demonstratives, these predicates do seem to have something to do with the ways we represent or think about categories or groups of individuals and the events they figure into.

The approach I have advocated here, including pointers to concepts and lexical packaging of those pointers, gives us a way to account for both sides; and I suggest, seems to get the balance right between cognitively thick and

thin meanings for predicates.[26] Making roots pointers to concepts allows us to grant the many connections between word meaning and concepts, and provides a way in which a concept gives each lexical item its specific meaning; while at the same time having meaning behave just as cognitively thin theories would have it when it comes to semantic composition. More generally, the linguistic behavior of lexical meaning is in accord with cognitively thin views. In some cases we can and should have it both ways. I maintain that predicates, at least causative verbs, are just such cases.

The way having it both ways is achieved is by casting concepts in a role familiar from recent discussions of metasemantics. According to the pointers proposal, concepts fix, or constrain, the values of appropriately typed variables. The fixing of the value can be done by whatever means the concept itself can provide—prototypes, exemplars, theories, or anything else—but these are not part of the lexical meaning of the expression. Fixing the value of a variable is what we typically see as a metasemantic role. This observation began in discussions of reference, where it was observed that it is useful to distinguish the semantic value of a referring expression from how that value is fixed. According to direct reference theories, for instance, the semantic value of a name is just its bearer (and not, of course a Fregean sense); but the way that value is fixed might be complex, involving, perhaps, Kripkean (1980) social-causal chains, or other such mechanisms. So long as apparatus like causal chains are part of the metasemantics, telling us how the name gets is semantic value but not being part of that value, their use is entirely compatible with direct reference theory.[27] This same idea can easily be applied to expressions like demonstratives and indexicals, where questions of how much speakers' intentions versus e.g. overt pointing gestures are responsible for their referents become metasemantic questions. Many of these expressions function semantically like variables (though just which do is disputed). So, with these sorts of context-dependent expressions, we have a clear instance of the idea that semantically what is present is a variable, and there is a metasemantic question of how the value of that variable gets fixed or constrained. This is just what we see with lexical entries for predicates,

[26]Specifically, for verbs with substantial packaging, like causatives. In other work in progress, I arge that we should extend the approach to adjectives, though there are enough differences with the case of verbs, both semantically and cognitively, to make that claim non-trivial.

[27]This observation is due to Stalnaker (1997). Very similar ideas are discussed by Kaplan (1989), who also introduces the term 'metasemantic'.

according to the proposal I have made here.[28]

Casting concepts in a metasemantic role offers a way to give credit to the idea that lexical meanings are cognitively thin, or at least, to meet that idea half-way. As the structure of a concept functions metasemantically, it is not part of the meaning of an expression itself. So, how a concept is stored in memory, or manipulated in thinking, is not part of the meaning. This does not make lexical meaning as cognitively thin as direct reference theory would have it, but it does, I suggest, account for some of the problems that made direct reference theory attractive. But there remains a very large issue. Thin or not, as the theory applies to examples like *kill* above, it makes their extensions internally determined. In the example of *kill*, the extension of the root is fixed by a theory speakers mentally represent. That is packaged as a causative verb, but the determinant of the extension is still that theory. It is fixed by something not in the lexical meaning of the word, but still 'in the head'. The meaning is internalist, not externalist.

I should pause to say that this seems right to me for *kill* and for many verbs. If you encountered someone who thought you could not kill plants, because they fail to move, you would plausibly conclude they have a quirky meaning for *kill* or *dead*. As is entirely well known, conclusive reasons to prefer this to concluding they have strange views about the world are hard to find, but in this case, I simply note, we see little reason not to take the internalist option. My suspicion is the same holds for many verbs. The metasemantic approach I have suggested here allows us to take an internalist approach to verb meanings, and not load all aspects of the cognition of categories into those meanings. That, I think, is a good result.

Even if it is, it is clearly not right for some expressions. Following the lead of Putnam (1975a), we have strong reasons to think that semantic externalism holds for natural kind terms, at least. So to take a familiar example, even if our concept of FISH is internally represented as a theory that classifies whales as fish, they are not, and should not fall in the extension.[29] The clear-

[28]The semantic/metasemantic distinction applies naturally to context-dependent expressions, as Kaplan (1989) noted. It was extended explicitly by Stanley & Szabó (2000) and discussed extensively in my (2007). Since then, the metasemantics of context-dependent expressions has become lively research area. See e.g. King (2014).

[29]Also, following the lead of Burge (1979), we must also recognize that for many terms, notably technical terms, speakers may have little by way of mental representations to go with them, and will defer to experts. I shall not dwell on this issue here. See Higginbotham (1989) for some interesting suggestions about how to incorporate this kind of

est cases of this are natural kind terms—which are common nouns—while I have been careful to note that my proposal may be restricted to specific classes of predicates, such as causative verbs. But nonetheless, I want to consider how an approach like mine might make room for semantic externalism where it is appropriate.

There are a range of options for how we might do so. One is to exploit some flexibility in the pointers and packaging approach. In the lexicon is a packaged root. According to this idea, roots function as a pointers, that enter into semantic composition as a variables whose values must be set. In the cases I considered, they are set by concepts. But it is open that some pointers' values are fixed differently. It is open that for expressions like *fish*, the root simply points to the kind, without mediation of the concept. As Putnam (1975a) originally noted, we can still have a mental representation to go with a term like this, but it could be inert for setting the value of the root variable. If this was so, it would mark a significant lexical difference between kind nouns like *fish* and verbs like *kill*. Indeed, there are differences between these terms, both semantically and in acquisition, so this is an option we should take seriously.[30] Of course, more needs to be said about how the facts would fix an extension (we still need a metasemantics!). Again following Putnam, we might concentrate on the role of samples in fixing extensions for kind terms.

Though this is an option, it is not the one I think is most promising. Another option is to pay more attention to the way we represent natural kinds. These representations, I suspect, themselves offer mechanisms that can link root variables to externally fixed classes.

The main idea here is what is known as *psychological essentialism*. This is the idea from work on the psychology of concepts and categorization that for kinds, our judgments take into account that kind membership is determined by the 'inner' nature of things. As Gelman (2003, p. 8) puts it, we think that these categories have "an underlying reality or true nature, shared by members of a category, that one cannot observe directly but that gives an object its identity and is responsible for other similarities that category members share."[31] There is a great deal of accumulated evidence for psychological essentialism for kinds (natural kinds, and perhaps some social and

anti-individualism in to a semantic theory.

[30]For discussion, see Gillette et al. (1999) and references therein.

[31]This sort of view is advocated by a number of researchers, notably Gelman (2003) and Medin & Ortony (1989). See again Rips (2011) for an overview.

artifact kinds). More specifically, older children and adults know that certain properties are more important than others for kind membership (e.g. Barton & Komatsu, 1989; Keil, 1995; Prasada & Dillingham, 2006), and younger children judge kind membership based on internal properties, not external appearance (e.g. Gelman & Wellman, 1991; Keil, 1989). Both children and adults believe that kinds often have essential properties that are causally responsible for properties of their members (e.g. Gelman, 2003; Gelman & Hirschfeld, 1999; Medin, 1989; Medin & Ortony, 1989). It is unclear how detailed knowledge of essential properties is. Sometimes it is thought to be not much more than a 'placeholder', in effect, like a variable (Medin & Ortony, 1989). Psychological essentialism is, of course, a view about how we think about kinds, not a view about what the membership in those kinds really is. And, as we would expect, some of the claims of essentialism remain controversial (e.g. Ahn, 1998; Braisby et al., 1996; Lombrozo, 2009; Malt, 1994; Strevens, 2001).

So, let us assume that psychological essentialism holds for the concepts linked to terms we most clearly want to treat as externalist, including natural kind terms. This suggests a mechanism by which an externally determined extension can result from a pointer to a concept. First, suppose it is part of our thinking about a kind that membership in it is determined by some underlying property, even though we may have little idea what that property might be. Then we can think that the relevant category is comprised of things that bear that property, whatever they may be. Hence, it may be part of our representations of certain categories that they have some such determining property. When we have pointers to concepts like this, the concept then in effect fixes the value of the relevant variable to be 'things that have the relevant property that makes them members of the kind ', but then leaves it up to the world provide the property and fix just what falls under it. The result is an externalist extension. We get it by way of the concept, though the concept does little work, except to direct us to the things that have some, possibly unknown, property. That passes the job of fixing an extension onto the worldly fact.

It is likely that this is not the whole story. Many psychological essentialists, notably Gelman (2003), deny that essences fix category membership, partly because they doubt that there are necessary and sufficient conditions for category membership, and partly in response to problems raised by Braisby et al. (1996) and Malt (1994). But what we really need to tell the sort of story I just did is for the concept to give instructions to bypass some

features of the way it represents the category for purposes of fixing the value of a variable. If it is part of a representation that there is an underlying set of properties, perhaps unknown, that are causally responsible for the properties of members of the category, this could trigger the constraint that the value of the variable be things that bear the underlying properties, whether or not these are conceived by agents as fixing the category in question, or are merely just important to its nature. This constraint would enforce an externalist semantics for the term in question.

To illustrate, suppose we represent TIGER in terms of exemplars that are striped. But suppose that representation also encodes that there are some, perhaps unknown, properties that are casually responsible for tigers being what they are like: typically striped, territorial predators, etc. Then the concept might tell us that a key constraint for fixing the value of a root variable linked to it is having those unknown underlying properties, and this can trump being similar to exemplars in other ways. That is enough to have the value be constrained in an externalist fashion.

My main claim here is that there can be aspects of a concept itself that trigger externalist constraints on values of variables linked to it. Psychological essentialist thinking, I suggest, is a good clue to those triggers. It would be nice if the way that worked was that the concept encoded placeholders for essential but unknown properties fixing category membership. If that is not how we represent kinds, but rather just have a rich underlying causal structure, that still may be enough to trigger externalist constraints. The underlying properties responsible for this causal structure can be dominant constraints when it comes to fixing extensions. This will allow the extension fixed to disagree with people's judgements of category membership, when those judgments follow more superficial features of typical instances. That is a substantial form of externalism (though no doubt less than some views might have it). If this option is viable, then we may not need to have a lexical entry encode an instruction to skip the concept, and fix an externally determined extension. It might be the concept itself that tells the lexical entry to do that. Both options can offer at least some externalist effects for lexical meanings, when those are required. Thus, I suggest, both options can make some room for semantic externalism, in some cases.

We have just been considering the proposal that the structure of concepts to which roots point triggers externalist interpretations. This proposal holds that there are externalist effects for lexical meanings just where the roots of those meanings are mapped to concepts with the right structure. That

structure is essentialist, I have proposed (but I have left open the possibility that some weaker causal structure might suffice). Kinds are good candidates for this, while, as I mentioned, other concepts seem not to be. The result would be that externalist semantics results from the nature of the concept to which a root points, not a special way of fixing the value of the root that is lexically encoded. I believe this avenue looks promising, and it is the view that I am tentatively endorsing here. Above I mentioned another option, that there are lexically encoded instructions to bypasses concepts in fixing pointers' values for some expressions. More needs to be done to determine which of these options is really right. The two options make different predications about variation in concepts and categorization versus variations in lexical structure, which I hope might turn out to be testable. Regardless, of which is right, both allow that typically roots are mapped to concepts, which are 'internal' mental representations, but also allow that in at least some cases extensions can depart from typical features specified by those representations.

Let me close this section by mentioning some questions that my proposal raises. First, It is unclear how far psychological essentialism extends, and so, what sorts of terms would get externalist semantics on my proposal. Specifically, it remains unclear whether psychological essentialism extends to artifact or social kinds. (See Gelman (2013) and Sloman & Malt (2003) for opposing views on this.) There also remain delicate issues about how the essentialist option I have proposed accounts for the modal status that externalists posit for extensions. It should be noted that there is evidence that at least for natural kinds, our representations are modally robust (see Rips (2001) for an overview), but questions about how that relates to metaphysical necessity are still open.

Above I took a basically internalist line about the meanings of verbs like *kill*, and I have contrasted it with the sort of meanings we might expect for natural kind terms. But we might also ask if some of the observations that support essentialism might also be employed to reduce, if to a limited extent, the effects of internalism in cases of verbs as well. As both Lance Rips and a referee asked, for instance, what of people who hold strong views that death is an initiation into the afterlife, as is central to many religions? What if those views cause people to contradict some of the components of (6)? The internalist idea is no doubt that at some point, we will reach enough differences to conclude that such a person really does have a different concept of death, and their word meaning is affected accordingly. That is the position

I took above. But this conclusion can be put off to extreme cases. Concepts, even those which are not amenable to essentialist treatments, can involve highly structured representations, which can include parts of a theory that are more or less central. We tend to think of this as a causal organization in may cases, and the theories that form concepts are typically assumed to reflect causal or explanatory structure. Not all of a person's beliefs, and not all of their 'theory', needs to be part of this. Thus, people *can* indeed think that death is an initiation into the afterlife without having a concept with crucially different structure. They can also simply have a different concept. How to tell which is one of those vexed questions in philosophy. Even so, we need not jump to conclusions about differences in concepts, or differences in word meanings, at any sign of difference in beliefs, even if we take the basically internalist line for verbs I prefer.[32]

In a related vein, we might worry whether the kind of 'folk biology' in which the theory of DEATH I sketched is embedded might be wrong, just as our 'folk physics' turns out to be. The internalist response, which here I do endorse, is that this would show that we have ordinary concepts, and ordinary word meanings, which might express false beliefs. We can find these useful approximations, but might prefer more robust scientific ones if accuracy is at a premium.

Though the approach to the lexicon I am proposing here is internalist in its emphasis on concepts, it offers a way that at least some well-established externalist effects might be accounted for. I have suggested that for kind terms, an approach working through psychological essentialism might be the best option, though there are others. Indeed, one possibility we now have open is that different sorts of terms show externalist effects for different reasons, and in different ways. That is a possibility worth exploring too.

6 Conclusion

This paper has extended the pointers and packing approach I have developed elsewhere, by showing how lexical roots can be treated as variables, whose values are constrained by concepts to which they point. This reveals how concepts play a metasemantic role for predicates. More carefully, I have

[32]We might also ask if this can help address other externalist challenges, for instance, those related to communication and theory change, from a basically internalist perspective. I shall have to defer discussion of this to another occasion.

proposed that they do for at least some predicates, including causative verbs. This proposal offers several benefits. Most important to the discussion here, it allows us to explain how a concept can fix the specific meaning of a lexical item, while still allowing familiar forms of semantic composition that preclude concepts. But furthermore, it allows concepts to play this role, while being linguistically atomic. It also allows us to avoid writing too much cognitive detail, like how concepts are stored in memory, into the meanings of words. It thus captures well the balance between cognitive and purely linguistic factors we see in lexical meaning. The proposal indicates that some predicates receive internalist semantics, such as the causative verbs we examined above. But, it leaves open options for semantic externalism as well, perhaps via the psychological essentialist nature of the concepts linked to some lexical roots.

It is not easy to get the balance between cognitive, grammatical, and referential properties right for lexical meaning. As we discussed above, philosophers, linguists, and psychologists have offered drastically different views on what that balance should be. I have suggested that the pointers and packaging approach offers a useful way to address this difficult problem. My focus here has mostly been on how it allows us to invoke concepts while using standard forms of semantic composition. But more generally, I suspect that putting concepts in a metasemantic role helps achieve the delicate balance we require. We get close connections between lexical meanings and cognition, while not over-burdening the grammar with facts about wider cognition, and not impeding referential and compositional semantics. We also get a theoretically pleasing account of the interface between language proper and wider cognition. The approach allows us to keep important aspects of the disparate views that have been proposed. This makes me suspect it is on the right track.

References

Ahn, W.-K. (1998). Why are different features central for natural kinds and artifacts?: The role of causal status in determining feature centrality. *Cognition*, 69, 135–178.

Aronoff, M. (1994). *Morphology by Itself*. Cambridge: MIT Press.

Barsalou, L. W. (1983). Ad hoc categories. *Memory and Cognition*, 11, 211–227.

——— (1987). The instability of graded structure: Implications for the nature of concepts. In U. Neisser (Ed.), *Concepts and Conceptual Development: Ecological and Intellectual Factors in Categorization*, pp. 101–140. Cambridge: Cambridge University Press.

——— (1991). Deriving categories to achieve goals. In G. H. Bower (Ed.), *The Psychology of Learning and Motivation*, pp. 1–64. New York: Academic Press.

Barton, M. E. & Komatsu, L. K. (1989). Defining features of natural kinds and artifacts. *Journal of Psycholinguistic Research*, 18, 433–447.

Ben-Yami, H. (2001). The semantics of kind terms. *Philosophical Studies*, 102, 155–184.

Bierwisch, M. (1982). Formal and lexical semantics. *Linguistische Berichte*, 30, 3–17.

——— (2011). Semantic features and primes. In C. Maienborn, K. von Heusinger, & P. Portner (Eds.), *Semantics: An International Handbook of Natural Language Meaning*, vol. 1, pp. 322–357. Berlin: de Gruyter Mouton.

Bierwisch, M. & Schreuder, R. (1992). From concepts to lexical items. *Cognition*, 42, 23–60.

Bloom, P. (2000). *How Children Learn the Meanings of Words*. Cambridge: MIT Press.

Borer, H. (2005). *Structuring Sense*, vol. 1. Oxford: Oxford University Press.

Borg, E. (2012). *Pursuing Meaning*. Oxford: Oxford University Press.

Braisby, N., Franks, B., & Hampton, J. (1996). Essentialism, word use, and concepts. *Cognition*, 59, 247–274.

Brown, C. (2011). Narrow mental content. In E. N. Zalta (Ed.), *Stanford Encyclopedia of Philosophy*, fall 2011 edn.

Burge, T. (1979). Individualism and the mental. *Midwest Studies in Philosophy*, 4, 73–121.

——— (1989). Wherein is language social. In A. George (Ed.), *Reflections on Chomsky*, pp. 175–191. Oxford: Basil Blackwell.

Cappelen, H. & Lepore, E. (2005). *Insensitive Semantics*. Oxford: Blackwell.

Carey, S. (1985). *Conceptual Change in Childhood*. Cambridge: MIT Press.

——— (2009). *The Origin of Concepts*. Oxford: Oxford University Press.

Carnap, R. (1947). *Meaning and Necessity*. Chicago: University of Chicago Press.

Chierchia, G. & McConnell-Ginet, S. (2000). *Meaning and Grammar*. 2nd edn. Cambridge: MIT Press.

Clark, E. V. (1983). Meaning and concepts. In P. H. Mussen (Ed.), *Handbook of Child Psychology*, vol. III: Cognitive Development, 4th edn., pp. 787–840. New York: Wiley.

Collins, J. (2004). Faculty disputes. *Mind and Language*, 19, 503–533.

——— (2011). Impossible words again: Or why beds break but not make. *Mind and Language*, 26, 234–260.

Contessa, G. (2007). There are kinds and kinds of kinds: Ben-Yami on the semantics of kind terms. *Philosophical Studies*, 136, 217–248.

Cresswell, M. J. (1973). *Logics and Languages*. London: Methuen.

Davidson, D. (1967). Truth and meaning. *Synthese*, 17, 304–323. Reprinted in Davidson (1984).

——— (1984). *Inquiries into Truth and Interpretation*. Oxford: Oxford University Press.

Donnellan, K. S. (1973). Substances and individuals. *Journal of Philosophy*, 70, 711–712. Abstract of a paper delivered to the American Philosophical Association.

Dowty, D. R. (1979). *Word Meaning and Montague Grammar*. Dordrecht: Reidel.

Dummett, M. (1975). What is a theory of meaning? (I). In S. Guttenplan (Ed.), *Mind and Language*, pp. 97–138. Oxford: Oxford University Press. Reprinted in Dummett (1993).

——— (1993). *The Sears of Language*. Oxford: Oxford University Press.

von Fintel, K. & Matthewson, L. (2008). Universals in semantics. *Linguistics Review*, 25, 139–201.

Fodor, J. A. (1970). Three reasons for not deriving "kill" from "cause to die". *Linguistic Inquiry*, 1, 429–438.

——— (1998). *Concepts: Where Cognitive Science Went Wrong*. Oxford: Oxford University Press.

Fodor, J. A. & Lepore, E. (1996). The pet fish and the red herring: Why concepts aren't prototypes. *Cognition*, 58, 243–276.

——— (1999). Impossible words? *Linguistic Inquiry*, 30, 445–453.

Gelman, S. A. (2003). *The Essential Child: Origins of Essentialism in Everyday Thought*. Oxford: Oxford University Press.

——— (2013). Artifacts and essentialism. *Review of Philosophy and Psychology*, 4, 449–463.

Gelman, S. A. & Hirschfeld, L. A. (1999). How biological is essentialism? In D. L. Medin & S. Atran (Eds.), *Folkbiology*, pp. 403–446. Cambridge: MIT Press.

Gelman, S. A. & Wellman, H. M. (1991). Insides and essences: Early understanding of the non-obvious. *Cognition*, 38, 213–244.

Gillette, J., Gleitman, H., Gleitman, L., & Lederer, A. (1999). Human simulations of vocabular learning. *Cognition*, 73, 135–176.

Glanzberg, M. (2007). Context, content, and relativism. *Philosophical Studies*, 136, 1–29.

——— (2011). Meaning, concepts, and the lexicon. *Croatian Journal of Philosophy*, 31, 1–29.

——— (2014). Explanation and partiality in semantic theory. In A. Burgess & B. Sherman (Eds.), *Metasemantics: New Essays on the Foundations of Meaning*, pp. 259–292. Oxford: Oxford University Press.

Gopnik, A. & Meltzoff, A. N. (1997). *Words, Thoughts, and Theories*. Cambridge: MIT Press.

Grimshaw, J. (2005). Semantic structure and semantic content in lexical representation. In *Words and Structure*, pp. 75–89. Stanford: CSLI Publications.

Hale, K. & Keyser, S. J. (1993). On argument structure and the lexical expression of syntactic relations. In K. Hale & S. J. Keyser (Eds.), *The View from Building 20*, pp. 53–109. Cambridge: MIT Press.

——— (2002). *Prolegomenon to a Theory of Argument Structure*. Cambridge: MIT Press.

Hampton, J. A. (1979). Polymorphous concepts in semantic memory. *Journal of Verbal Learning and Verbal Behavior*, 18, 441–461.

——— (1991). The combination of prototype concepts. In P. J. Schwanenflugel (Ed.), *The Psychology of Word Meaning*, pp. 91–116. Hillsdale, NJ: Erlbaum.

——— (1993). Prototype models of concept representation. In I. van Mechelen, J. A. Hampton, R. S. Michalski, & P. Theuns (Eds.), *Categories and Concepts: Theoretical Views and Inductive Data Analysis*, pp. 67–95. New York: Academic Press.

Harley, H. (2012). Lexical decomposition in modern generative grammar. In M. Werning, W. Hinzen, & E. Machery (Eds.), *Oxford Handbook of Compositionality*, pp. 328–350. Oxford: Oxford University Press.

Heim, I. & Kratzer, A. (1998). *Semantics in Generative Grammar*. Oxford: Blackwell.

Higginbotham, J. (1985). On semantics. *Linguistic Inquiry*, 16, 547–593.

——— (1989). Knowledge of reference. In A. George (Ed.), *Reflections on Chomsky*, pp. 153–174. Oxford: Basil Blackwell.

Jackendoff, R. (1983). *Semantics and Cognition*. Cambridge: MIT Press.

——— (1990). *Semantic Structures*. Cambridge: MIT Press.

——— (2011). Conceptual semantics. In C. Maienborn, K. von Heusinger, & P. Portner (Eds.), *Semantics: An International Handbook of Natural Language Meaning*, vol. 1, pp. 688–709. Berlin: de Gruyter Mouton.

Johnson, K. (2004). From impossible words to conceptual structure: The role of structure and process in the lexicon. *Mind and Language*, 19, 334–358.

Kamp, H. & Partee, B. (1995). Protype theory and compositionality. *Cognition*, 57, 129–191.

Kaplan, D. (1973). Bob and Carol and Ted and Alice. In J. Hintikka, J. Moravcsik, & P. Suppes (Eds.), *Approaches to Natural Language*, pp. 490–518. Dordrecht: Reidel.

——— (1989). Afterthoughts. In J. Almog, J. Perry, & H. Wettstein (Eds.), *Themes from Kaplan*, pp. 565–614. Oxford: Oxford University Press.

Keefe, R. & Smith, P. (Eds.) (1997). *Vagueness: A Reader*. Cambridge: MIT Press.

Keil, F. C. (1989). *Concepts, Kinds, and Cognitive Development*. Cambridge: MIT Press.

——— (1995). The growth of causal understanding of natural kinds. In D. Sperber, D. Premack, & A. J. Premack (Eds.), *Causal Cognition: A Multidisciplinary Debate*, pp. 234–262. Oxford: Oxford University Press.

King, J. C. (2014). The metasemantics of contextual sensitivity. In A. Burgess & B. Sherman (Eds.), *Metasemantics: New Essays on the Foundations of Meaning*, pp. 97–118. Oxford: Oxford University Press.

Klein, E. & Sag, I. A. (1985). Type-driven translation. *Linguistics and Philosophy*, 8, 163–201.

Krifka, M. (1998). The origins of telicity. In S. Rothstein (Ed.), *Events and Grammar*, pp. 197–235. Dordrecht: Kluwer.

Kripke, S. A. (1980). *Naming and Necessity*. Cambridge: Harvard University Press.

Lang, E. & Maienborn, C. (2011). Two-level semantics: Semantic form and conceptual structure. In C. Maienborn, K. von Heusinger, & P. Portner (Eds.), *Semantics: An International Handbook of Natural Language Meaning*, vol. 1, pp. 709–740. Berlin: de Gruyter Mouton.

Larson, R. K. & Segal, G. (1995). *Knowledge of Meaning*. Cambridge: MIT Press.

Lau, J. & Deutsch, M. (2014). Externalism about mental content. In E. N. Zalta (Ed.), *Stanford Encyclopedia of Philosophy*, summer 2014 edn.

Laurence, S. & Margolis, E. (1999). Concepts and cognitive science. In E. Margolis & S. Laurence (Eds.), *Concepts: Core Readings*, pp. 1–81. Cambridge: MIT Press.

Levin, B. & Rappaport Hovav, M. (1995). *Unaccusativity: At the Syntax-Lexical Semantics Interface*. Cambridge: MIT Press.

——— (2005). *Argument Realization*. Cambridge: Cambridge University Press.

Lewis, D. (1970). General semantics. *Synthese*, 22, 18–67. Reprinted in Lewis (1983).

——— (1983). *Philosophical Papers*, vol. 1. Oxford: Oxford University Press.

Lombrozo, T. (2009). Explanation and categorization: How "why?" informs "what?". *Cognition*, 110, 248–253.

Malt, B. C. (1991). Word meaning and word use. In P. J. Schwanenflugel (Ed.), *The Psychology of Word Meaning*, pp. 37–70. Hillsdale, NJ: Erlbaum.

——— (1994). Water is not H_2O. *Cognitive Psychology*, 27, 41–70.

Markman, A. B. (1999). *Knowlege Representation*. Mahwah, NJ: Erlbaum.

McDowell, J. (1987). In defense of modesty. In B. Taylor (Ed.), *Michael Dummett: Contributions to Philosophy*, pp. 59–80. Dordrecht: Martinus Nijhoff.

Medin, D. L. (1989). Concepts and conceptual structure. *American Psychologist*, 44, 1469–1481.

Medin, D. L. & Ortony, A. (1989). Psychological essentialism. In S. Vosniadou & A. Ortony (Eds.), *Similarity and Analogical Reasoning*, pp. 179–195. Cambridge: Cambridge University Press.

Medin, D. L. & Schaffer, M. M. (1978). Context theory of classification learning. *Psychological Review*, 85, 207–238.

Montague, R. (1973). The proper treatment of quantification in ordinary English. In J. Hintikka, J. Moravcsik, & P. Suppes (Eds.), *Approaches to Natural Language*, pp. 221–242. Dordrecht: Reidel. Reprinted in Montague (1974).

——— (1974). *Formal Philosophy*. New Haven: Yale University Press. Edited by R. H. Thomason.

Murphy, G. L. (1991). Meaning and concepts. In P. J. Schwanenflugel (Ed.), *The Psychology of Word Meaning*, pp. 11–35. Hillsdale, NJ: Erlbaum.

——— (2002). *The Big Book of Concepts*. Cambridge: MIT Press.

Murphy, G. L. & Medin, D. L. (1985). The role of theories in conceptual coherence. *Psychological Review*, 92, 289–316.

Nguyen, S. P. & Gelman, S. A. (2002). Four and 6-year olds' biological concept of death: The case of plants. *British Journal of Developmental Psychology*, 20, 495–513.

Nosofsky, R. M. (1986). Attention, similarity, and the identification-categorization relationship. *Journal of Experimental Psychology: General*, 115, 39–57.

——— (1992). Exemplars, prototypes, and similarity rules. In A. F. Healy, S. M. Kosslyn, & R. M. Shiffrin (Eds.), *From Learning Theory to Connectionist Theory: Essays in Honor of William K. Estes*, vol. 1, pp. 149–167. Hillsdale, NJ: Erlbaum.

Osherson, D. N. & Smith, E. E. (1981). On the adequacy of prototype theory as a theory of concepts. *Cognition*, 9, 35–58.

Parsons, T. (1990). *Events in the Semantics of English*. Cambridge: MIT Press.

Paul, L. A. & Hall, N. (2013). *Causation: A User's Guide*. Oxford: Oxford University Press.

Pesetsky, D. (1995). *Zero Syntax*. Cambridge: MIT Press.

Pietroski, P. M. (2002). Function and concatenation. In G. Preyer & G. Peter (Eds.), *Logical Form and Language*, pp. 91–117. Oxford: Oxford University Press.

——— (2010). Concepts, meanings and truth: First nature, second nature and hard work. *Mind and Language*, 25, 247–278.

——— (2012). Semantic monadicity with conceptual polyadicity. In M. Werning, W. Hinzen, & E. Machery (Eds.), *Oxford Handbook of Compositionality*, pp. 129–148. Oxford: Oxford University Press.

Pinker, S. (1989). *Learnability and Cognition*. Cambridge: MIT Press.

Pothos, E. M. & Wills, A. J. (Eds.) (2011). *Formal Approaches in Categorization*. Cambridge: Cambridge University Press.

Prasada, S. & Dillingham, E. M. (2006). Principled and statistical connections in common sense conception. *Cognition*, 99, 72–112.

Prinz, J. J. (2002). *Furnishing the Mind: Concepts and Their Perceptual Basis*. Cambridge: MIT Press.

——— (2012). A defense of prototype compositionality. In M. Werning, W. Hinzen, & E. Machery (Eds.), *Oxford Handbook of Compositionality*, pp. 437–453. Oxford: Oxford University Press.

Putnam, H. (1975a). The meaning of 'meaning'. In K. Gunderson (Ed.), *Language, Mind and Knowledge*, vol. VII of *Minnesota Studies in the Philosophy of Science*, pp. 131–193. Minneapolis: University of Minnesota Press. Reprinted in Putnam (1975b).

——— (1975b). *Mind, Language and Reality*, vol. II of *Philosophical Papers*. Cambridge: Cambridge University Press.

Rappaport Hovav, M. & Levin, B. (1998). Building verb meanings. In M. Butt & W. Geuder (Eds.), *The Projection of Arguments*, pp. 97–134. Stanford: CSLI Publications.

Rips, L. J. (1989). Similarity, typicality, and categorization. In S. Vosniadou & A. Ortony (Eds.), *Similarity and Analogical Reasoning*, pp. 21–59. Cambridge: Cambridge University Press.

——— (2001). Necessity and natural categories. *Psychological Bulletin*, 127, 827–852.

——— (2011). *Lines of Thought: Central Concepts in Cognitive Psychology*. Oxford: Oxford University Press.

Rips, L. J., Smith, E. E., & Medin, D. L. (2012). Concepts and categories: Memory, meaning, and metaphysics. In K. J. Holyoak & R. G. Morrison (Eds.), *Oxford Handbook of Thinking and Reasoning*, pp. 177–209. Oxford: Oxford University Press.

Rosch, E. (1978). Principles of categorization. In E. Rosch & B. B. Lloyd (Eds.), *Cognition and Categorization*, pp. 27–48. Hillsdale, NJ: Erlbaum.

Rosch, E. & Mervis, C. B. (1975). Family resemblances: Studies in the internal structure of categories. *Cognitive Psychology*, 7, 573–605.

Rothstein, S. (2004). *Structuring Events*. Oxford: Blackwell.

Salmon, N. U. (2005a). Are general terms rigid? *Linguistics and Philosophy*, 28, 117–134.

——— (2005b). *Reference and Essence*. 2nd edn. Amherst: Prometheus Books. First edition 1981.

Slaughter, V., Jaakkola, R., & Carey, S. (1999). Constructing a coherent theory: Children's biological understanding of life and death. In M. Siegal & C. C. Peterson (Eds.), *Children's Understanding of Biology and Health*, pp. 71–96. Cambridge: Cambridge University Press.

Sloman, S. A. & Malt, B. C. (2003). Artifacts are not ascribed essences, nor are they treated as belonging to kinds. *Language and Cognitive Processes*, 18, 563–582.

Smith, E. E. & Medin, D. L. (1981). *Categories and Concepts*. Cambridge: Harvard University Press.

Smith, E. E., Osherson, D. N., Rips, L. J., & Keane, M. (1988). Combining prototypes: A selective modification model. *Cognitive Science*, 12, 485–527.

Soames, S. (1989). Semantics and semantic competence. *Philosophical Perspectives*, 3, 575–596.

——— (2002). *Beyond Rigidity: The Unfinished Semantic Agenda of* Naming and Necessity. Oxford: Oxford University Press.

Stalnaker, R. (1997). Reference and necessity. In B. Hale & C. Wright (Eds.), *Companion to the Philosophy of Language*, pp. 534–554. Oxford: Blackwell.

Stanley, J. & Szabó, Z. G. (2000). On quantifier domain restriction. *Mind and Language*, 15, 219–261.

Strevens, M. (2001). The essential aspects of naive theories. *Cognition*, 74, 149–175.

Tarski, A. (1935). Der Wahrheitsbegriff in den formalizierten Sprachen. *Studia Philosophica*, 1, 261–405. References are to the translation by J. H. Woodger as "The concept of truth in formalized languages" in Tarski (1983).

——— (1983). *Logic, Semantics, Metamathematics*. 2nd edn. Indianapolis: Hackett. Edited by J. Corcoran with translations by J. H. Woodger.

Thomason, R. H. (2014). Formal semantics for causal constructions. In B. Copley & F. Martin (Eds.), *Causation in Grammatical Structures*, pp. 58–75. Oxford: Oxford University Press.

Vigliocco, G. & Vinson, D. P. (2007). Semantic representation. In M. G. Gaskell (Ed.), *Oxford Handbook of Psycholinguistics*, pp. 195–215. Oxford: Oxford University Press.

Wikforss, Å. (2007). Semantic externalism and psychological externalism. *Philosophy Compass*, 3, 158–181.

Williamson, T. (1994). *Vagueness*. London: Routledge.

Wilson, D. & Carston, R. (2007). A unitary approach to lexical pragmatics: Relevance, inference and *ad hoc* concepts. In N. Burton-Roberts (Ed.), *Pragmatics*, pp. 230–259. London: Palgrave Macmillan.

Wunderlich, D. (1997). Cause and the structure of verbs. *Linguistic Inquiry*, 28, 27–68.