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Type-token representations in conceptual representation

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Abstract

Concepts of kinds of things (e.g. DOG), have the dual function of specifying how to think about indefinitely many things as well as providing the means for thinking about a single abstract kind which is constituted by indefinitely many instances. In this talk, I sketch a theory of conceptual representation that places this dual function of concepts at its core. The theory is shown to provide a natural way of capturing four key characteristics of the ways in which we think about kinds and instances of kinds. These characteristics are not accounted for by standard approaches to conceptual representation. In the final section of the paper, I consider how the phenomena discussed in this paper may be accommodated by current approaches to conceptual representation.

Keywords: concepts; type-token representations; kind representations; generic knowledge.

Concepts are the mechanisms by which we think about things. For example, the concept DOG provides the means for thinking about indefinitely many distinct things as being a given kind of thing (e.g. dogs). Furthermore, it also provides the means for thinking about the kind dog itself. This dual function of specifying how to think about indefinitely many things as well as providing the means for thinking about a single abstract kind which is constituted by indefinitely many instances has generally escaped the focus of most research on conceptual representation. In this paper, I sketch a theory of conceptual representation that places this dual function of concepts at its core. The theory is shown to provide a natural way of capturing four key characteristics of the ways in which we think about kinds and instances of kinds. These characteristics are not currently accounted for by standard approaches to conceptual representation, however, they constitute empirical phenomena that any adequate theory of conceptual representations would have to handle. In the final section of the paper, I consider how the phenomena discussed in this paper may be accommodated by current approaches to conceptual representation.

Mechanism for thinking about instances of kinds and kinds.

Following Prasada & Dillingham (2009) and Prasada (2012), the theory developed here proposes that concepts for kinds of things are represented via a generative type-token mechanism such as (1) which is capable of generating

indefinitely many representations (2) each of which provide the means for thinking about distinct instances of that kind.

(1)		K_i	
(2)	K_1	K_2	$K_3 \dots$

The mechanisms in (1) and (2) highlight the close connection between the mechanisms needed to make generic and non-generic reference. The mechanisms needed for thinking about instances of kinds (2) are generated by the mechanism needed for thinking about kinds (1) which makes implicit reference to instances of kinds. As such, the mechanisms that underlie generic and non-generic reference are intrinsically related and thus one may expect the ability to make generic and non-generic reference to be closely tied in development. This is, in fact, the case. Recent research suggests that children appear to use noun phrases generically and non-generically from a very early age (Pappas & Gelman, 1998; Gelman & Tardif, 1998; Goldin-Meadow, Mylander & Gelman, 2005; Gelman, Goetz, Sarnecka & Flukes, 2008).

Instances of kinds may be qualitatively identical.

The mechanisms in (1) and (2) also highlight a fundamental characteristic of the manner in which we think about instances of kinds. Instances of a given kind need not be qualitatively distinct in any way. They need only be numerically distinct. Thus we are perfectly capable of thinking about qualitatively identical instances of kinds. This is, of course, easier to do for some kinds (e.g. paperclips) than others (e.g. dogs), nevertheless, it is possible for any kind of thing and our conceptual mechanisms must support such thoughts. This characteristic of how we think about instances of kinds is captured by the fact that the representations in (2) differ only in their indices which have a purely indexical function and have no intrinsic descriptive content.

Distinct kinds cannot be qualitatively identical.

Turning our attention to the representation of kinds (1), a natural question is whether kind representations may also be distinguished merely by an index (e.g. K_i^1 & K_i^2). A moment's reflection makes it clear that it makes no sense to speak of qualitatively identical and merely numerically distinct kinds. Kinds, unlike instances of kinds, must be qualitatively distinct. This means that the representation of kinds in (1) must be augmented with a component that has

descriptive content that characterizes the kind and provides the basis for individuating kinds.

Given that kinds are constituted by indefinitely many instances, characterizing a kind must involve representing a connection between the kind and properties that is understood to be non-accidental and thus extendible to indefinitely many instances that have yet to be encountered (Goodman, 1955). Prasada, Khemlani, Leslie & Gucksberg (2013) provide evidence that our conceptual systems distinguish at least three types of non-accidental connections between kinds and properties (principled connections, statistical connections, and causal connections) that provide at least three ways of characterizing kinds. Nevertheless, kinds cannot be generally be individuated in terms of properties that involve merely statistical connections to the kind because such properties are extrinsic to the kind. Furthermore, kinds cannot be generally be individuated in terms of properties that involve causal connections to kinds because such connections are only possible for material kinds.

Principled connections, on the other hand, involve properties that instances of kinds are understood to have by virtue of their being the kinds of things they are (e.g. having four legs for dogs) (Prasada & Dillingham, 2006). As such, it is possible to identify properties that have a principled connection to a kind for any kind of thing. Properties that have a principled connection to a kind (*k-properties* in Prasada & Dillingham's (2006) terminology) are (i) properties whose presence in instances of a kind receive formal explanations -- explanations by reference to the kind of thing something is (e.g. Fido has four legs because he is a dog), (ii) properties for which we have normative expectations such that instances of the kind that lack *k-properties* are judged to be defective or incomplete, and (iii) properties that are generally expected to be present in instances of the kind (Prasada & Dillingham, 2006, 2009). *K-properties* differ from definitional properties in important ways. Unlike definitional properties which are necessarily present in all instances of a kind, *k-properties* need not be present in all instances of the kind (e.g. there are many dogs that do not have four legs). Relatedly, the representation of definitional properties are understood as specifying necessary conditions for the use of the kind concept of which they are a part whereas *k-property* representations do not specify conditions for the use of the kind concept with which they are connected. Instead, *k-property* representations specify properties that are understood to be lawfully related to being that kind of thing such that the presence of *k-properties* in instances of a kind is understood to be due the things being the kinds of things they are. In fact, *k-properties* are understood to be aspects of being the given kind of thing (e.g. having four legs is one aspect of being a dog) and thus are represented via a formal part-whole relation between the kind and property (Prasada & Dillingham, 2009). These findings lead Prasada & Dillingham (2009) to revise the mechanism for representing kinds in the following manner.

(3) $K_i \sim a_1, a_2 \dots$

In this representation (3), the mechanism for representing a kind projects¹ an aspect structure by means of which the properties that have a principled connection to the kind (*k-properties*) can be represented as aspects of being that kind of thing.²

The mechanism for representing kinds (3) is now seen to have a descriptive component in terms of which kinds are (qualitatively) individuated via distinct sets of *k-properties*. It should be noted that though kinds cannot be merely numerically distinct and thus kind representations cannot be distinguished merely by indexical representations devoid of any descriptive content (e.g. K_i^1 & K_i^2), it is possible that kinds may be distinguished indexically in addition to being distinguished qualitatively via their *k-properties*. In fact, it is possible that developmentally it is sometimes the case that two kinds may initially be distinguished only indexically via their names with the expectation that they will additionally differ in yet to be discovered ways (Xu, 2012). The theory being developed here suggests that in such cases, the expectation is that the kinds also differ in their *k-properties*.

Modes of existence of instances of kinds and kinds.

The mechanisms in (3) and (2) also highlight an important difference between the ways in which we think about instances of kinds and kinds. At any given time, there are some definite number of instances of a kind that actually exist or have actually existed. In addition, there are indefinitely many instances of the kind that do not actually exist, but exist only potentially. Potentially existing instances of a kind differ from actually existing instances of a kind only in their mode of existence. No qualitative differences distinguish actually existing and potentially existing instances of a kind. Given that this is the case, it should be immediately evident that there cannot be potentially existing kinds as this would require that the putatively potentially existing kinds be qualitatively identical to actually existing kinds, but as we saw above, distinct kinds cannot be qualitatively identical.

Relation to existing theories of conceptual representation.

The phenomena pertaining to the manner in which we think about kinds and instances of kinds discussed in this paper are generally not addressed by standard approaches to conceptual representation. How might standard approaches to conceptual representation respond to these phenomena? To answer this question, it will be helpful to summarize the

¹ I use the $\sim$ symbol to mean "projects". Prasada & Dillingham (2009) and Prasada (2012) use $\rightarrow$ for the same notion, however, that is easily confused with implication.

² As the details of how principled connections are represented via such a mechanism are not pertinent here, I skip over them. See Prasada & Dillingham (2009) for details.

generative type-token mechanism theory proposed in the present paper and situate standard approaches with respect to it. As illustrated in Figure 1, a kind concept such as DOG is, at its core, a generative mechanism which has the capacity to generate indefinitely many representations each of which represent an instance of the kind and which are distinguished from one another numerically via an index devoid of any intrinsic descriptive content. The generative mechanism itself implicitly contains the indefinitely many instances and thus provides the means for thinking about the kind itself. Finally, the kind projects an aspect structure which provides the means for representing the properties that have a principled connection to the kind (k-properties) as aspects of being that kind of thing. This component of the mechanism serves to qualitatively distinguish the kind from other kinds.

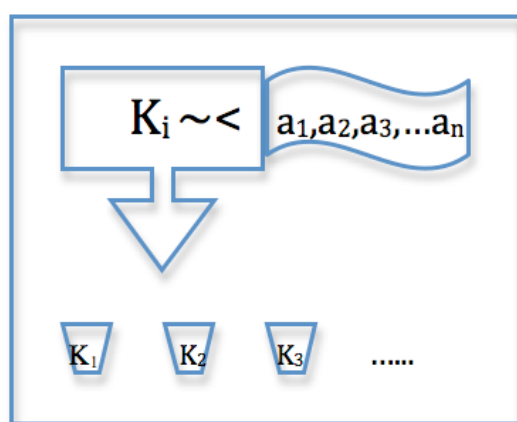


Figure 1. Schematic summary of the generative type-token mechanism that provides the means for thinking about kinds and instances of kinds.

Given this characterization, it becomes evident that the definitional, prototype and theory approaches to conceptual representation can best be understood as corresponding to the aspect structure component of the approach developed here in that they provide different accounts of how kinds are qualitatively individuated from one another. As such, these approaches, as currently formulated, lack the mechanisms for thinking and reasoning about kinds and instances of kinds. The exemplar approach to conceptual representation, on the other hand, involves representations that correspond most closely to those that represent instances of kinds. The exemplar approach lacks any mechanisms for representing kinds or information for individuating kinds, by design.

We are now in a position to consider how standard approaches may accommodate the phenomena discussed in the present paper which are handled naturally by the generative type-token mechanism approach. One possibility is that each approach may use the tools within their framework to incorporate these phenomena. While this may be possible, it is hard to see what relevant resources exist within the definitional, prototype, exemplar, or theory theories to form representation of instances of kinds and kinds such that they have the characteristics discussed here. A second possibility which would be available to the

definitional, prototype and theory approaches would be to graft the formal mechanisms developed here onto one's favorite approach. This avenue would be in line with suggestions in the philosophical and psychological favoring hybrid theories of conceptual representation (e.g. Genone & Lombrozo, 2012; Keil, 1989; McNorgan, Kotack, Meehan, & McRae, 2007; Sloman, Love & Ahn, 1998). This option is presumably not available to the exemplar approach which eschews summary representations and thus kind representations and components of kind representations that individuate kinds could presumably not be grafted onto exemplar representations. A third response may be to see the present work as potentially increasing the diversity of conceptual representations available thus providing further fuel to theories favoring conceptual pluralism and heterogeneity (Dove, 2009; Machery, 2009; Weiskopf, 2009).

The final possibility I'd like to consider and endorse is that the present theory contains key elements from each of the standard approaches and thus it may be possible to develop a theory of conceptual representation that has many of the advantages of hybrid theories, but in a manner that is more principled and organic. The present theory involves the generation of representations of instances of kinds (2) and thus provides a natural way of accounting for phenomena that are best handled by exemplar theories of concepts. Furthermore, the k-properties that individuate kinds do not specify conditions for the application of the kind concept. Instead, they specify properties that instances of the kind are expected to have in virtue of their being the kinds of things they are but may be lacking in instances for reasons other than their being the kinds of things they are (Prasada & Dillingham, 2006, 2009). As such, the k-properties that characterize a kind are like properties in prototype representations in that they are typically present in members of the kind, but need not be.

The link to the explanation-based theory approach to concepts is evident in the fact that the k-properties are represented as involving a lawful (non-accidental) link between the kind and properties. The mechanism in (3) represents principled connections between kinds and properties by representing the property as an aspect of being that kind of thing. As such, it supports a formal mode of explanation whereby the presence of k-properties in instances of kinds may be explained by reference to the kind of thing something is (Prasada & Dillingham, 2009). The mechanism in (3) also provides the basis for psychological essentialism by identifying the properties that are understood to be caused by the essence. As the essence is typically not known (Medin & Ortony, 1989; Gelman, 2003), the properties caused by the essence cannot be identified by the essence and must be identified in another manner. The k-properties represented in (3) thus potentially provide the basis for psychological essentialism.

Furthermore, as mentioned above, kinds may also be characterized via the causal and statistical connections they have to properties (Prasada, Khemlani, Leslie & Gucksberg,

2013). Though the addition of causal and statistical connections between kinds and properties to the mechanism in (3) is not required by our ability to think about kinds and instances of kinds (as is the addition of principled connections), their addition is necessary for capturing the range of ways in which we can characterize kinds. As such, their addition is principled and motivated within the present approach and allows the theory to capture further phenomena that are typically accounted for within the prototype and theory views of concepts.

Though much more needs to be said, I hope it is already evident that a theory which is centered on the generative type-token mechanisms needed for thinking about kinds and instances of kinds can not only capture the phenomena discussed in the present paper, but potentially provides a principled and organic way of capturing the key characteristics of current approaches to conceptual representation.

References

- Dove, G. (2009). Beyond perceptual symbols: A call for representational pluralism. *Cognition*, 110, 412–431.
- Gelman, S.A., & Tardif, T. Z. (1998). Generic noun phrases in English and Mandarin: An examination of child-directed speech. *Cognition*, 66, 215–248.
- Gelman, S. (2003). *The essential child: Origins of essentialism in everyday thought*. London: Oxford University Press.
- Gelman, S. A., Goetz, P. J., Sarnecka, B. S., & Flukes, J. (2008). Generic language in parent-child conversations. *Language Learning and Development*, 4, 1-31.
- Genone, J. & Lombrozo, T. (2012): Concept possession, experimental semantics, and hybrid theories of reference, *Philosophical Psychology*, 25:5, 717-742.
- Goldin-Meadow, S., Gelman, S.A. & Mylander, C. (2005). Expressing generic concepts with and without a language model. *Cognition*, 96, 109-126.
- Goodman, N. (1955). *Fact, fiction & forecast*. Cambridge, MA . Harvard University Press.
- Keil, F. C. (1989). *Concepts, kinds, and cognitive development*. Cambridge, MA: MIT Press.
- Machery, E. (2009). *Doing without concepts*. Oxford, UK: Oxford University Press.
- McNorgan, C., Kotack, R.A., Meehan, D.C., & McRae, K. (2007). Feature-feature causal relations and statistical co-occurrences in object concepts. *Memory & Cognition*, 35, 418–431.
- Medin, D., & Ortony, A. (1989). Psychological essentialism. In S. Vosniadou, & A. Ortony (Eds.), *Similarity and analogical reasoning*. Cambridge, MA: Cambridge University Press.
- Pappas, A. & Gelman, S.A. (1998). Generic noun phrases in mother-child conversations. *Journal of Child Language*, 25, 19–33.
- Prasada, S. (2012). Mechanisms for characterizing kinds and classes. *Recherches Linguistiques de Vincennes*, 41, 45-62.
- Prasada, S., & Dillingham, E. (2006). Principled and statistical connections in common sense conception. *Cognition*, 99 (1).
- Prasada, S., & Dillingham, E. (2009). Representation of principled connections: A window onto the formal aspect of common sense conception. *Cognitive Science*, 33, 401-448.
- Prasada, S., Khemlani, S., Leslie, S-J., & Gucksberg, S. (2013). Conceptual distinctions amongst generics. *Cognition*, 126, 405-422.
- Sloman, S. A., Love, B. C., & Ahn, W. (1998). Feature centrality and conceptual coherence. *Cognitive Science*, 22, 189–228.
- Weiskopf, D. A. (2009). The plurality of concepts. *Synthese*, 169, 145–173.
- Xu, F. (2012). Count nouns, sortal concepts, and the nature of early words. . In F.J. Pelletier, ed. *Kinds, Things & Stuff*. New Directions in Cognitive Science, v. 12, Oxford Univ. Press, NY.