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Commentary on Ruth Garrett Millikan (1998). A common structure for concepts of individuals, stuffs, and real kinds: More Mama, more milk, and more mouse. BBS 21:55–100.

Abstract of the original article: Concepts are highly theoretical entities. One cannot study them empirically without committing oneself to substantial preliminary assumptions. Among the competing theories of concepts and categorization developed by psychologists in the last thirty years, the implicit theoretical assumption that what falls under a concept is determined by description (“descriptionism”) has never been seriously challenged. I present a nondescriptionist theory of our most basic concepts, “substances,” which include (1) stuffs (gold, milk), (2) real kinds (cat, chair), and (3) individuals (Mama, Bill Clinton, the Empire State Building). On the basis of something important that all three have in common, our earliest and most basic concepts of substances are identical in structure. The membership of the category “cat,” like that of “Mama,” is a natural unit in nature, to which the concept “cat” does something like pointing, and continues to point despite large changes in the properties the thinker represents the unit as having. For example, large changes can occur in the way a child identifies cats and the things it is willing to call “cat” without affecting the extension of its word “cat.” The difficulty is to cash in the metaphor of “pointing” in this context. Having substance concepts need not depend on knowing words, but language interacts with substance concepts, completely transforming the conceptual repertoire. I will discuss how public language plays a crucial role in both the acquisition of substance concepts and their completed structure.

Identifying, reidentifying, and misidentifying

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Abstract: Millikan (1998a) relies on the ability an organism may have to reidentify external objects. It is difficult to develop an account of how this might occur because the organism could make a mistake in the tokening of a concept; it could misidentify the external object. To sustain her nondescriptivism, Millikan's account of reidentification must make the link between concept and object arbitrary. However, to make mistakes possible, there must be a norm for the production of concepts. These two requirements seem to leave no room for a middle ground.

Millikan's (1998t) stimulating reconceptualization of concepts rests on the ability an organism may have to reidentify external objects. Without this ability there is little chance that a concept will point at subsequent presentations of an object, and without that the concept cannot help the organism learn about the external object. Thus, without reidentification, concepts are unable to do the work Millikan proposes they do. How does reidentification occur then? What makes this question particularly troubling is the possibility of making an error in tokening a concept. The cognitive systems responsible for producing concepts can make errors in two ways: (suppose C is the concept that points at mice) (1) C may be tokened in response to something that is not a mouse or (2) D may be tokened in response to a mouse. Corresponding to these two types of errors, there are two questions for Millikan to answer: (Q1) What makes C a concept that points at mice and (Q2) What makes D not a concept that points at mice?

The difficulty that (Q1) presents Millikan is that, in order to maintain her nondescriptivist position, she must claim that the connection between a concept and its object is arbitrary, but, in order for the tokening of a concept to be a mistake, there must be some pre-established norm for the tokening of the concept. The worry is that there is no way to establish such a norm without violating the arbitrary link between concept and object needed for Millikan's nondescriptivism. Here are several answers Millikan might give to (Q1) and reasons to think they will not work:

(1) Millikan tells us that a concept of A is a concept of A, not B, "because A is what the thinker has been conceptually, hence physically, tracking and picking up information about, and because the concept has been tuned to its present accuracy by causal interactions with either the members of A's specific domain or with A itself, during the evolutionary history of the species or through the learning history of the individual" (sect. 5, para. 14). Thus C is a concept of mice because it has been tracking mice. What is the evidence that it has been tracking mice? If C is tokened in response to mice and elephants and shrews, what makes C a mouse concept rather than a mammal concept, a four-legged animal concept, or some other concept? One has apparently been tracking and picking up information about all these things through one's use of C. How can we differentiate correct and incorrect tokenings of C if it is what the correct tokenings of C have in common that is supposed to tell us which are the correct ones? All tokenings of C have something in common (perhaps C is the concept that points to external objects). Perhaps Millikan's comments about the tuning of the concept shed light on this.

(2) We might suppose that the thinker has learned about mice through tokenings of C, and not about whatever it is to which C is pointing this time. Thus the thinker has learned that mice like cheese, that they are small mammals, that they are grey, and so on. The object to which C is currently pointing does not have all these properties, so it is not properly part of the extension of C. However, this way of securing reidentification has at least one unpalatable consequence. There must be no possibility of a mistokening in the early occurrences of C. An early tokening of C that pointed to an elephant would have disastrous results, the consequence being that the information collected about the object to which C points may turn out to apply to no actual object, for ex-

ample, a mammal that washes itself with its trunk and is afraid of cats. Thus we are led to the conclusion that, the first times a child uses a particular concept to point at something, the thing will be the same, but it seems extremely unlikely that the child would start with a perfect record and then make errors later on. It is much more likely to make more errors in the early days and fewer errors as it gets older.

(3) Millikan also suggests that evolution plays a role. Maybe the idea is that selection has operated on concepts, so that C is the concept that points at mice because C has been selected to be that concept. If this is the answer Millikan prefers, she owes us an explanation of how that selection might occur. What were the forces that drove it? What sort of variation of concepts might there have been that allowed for selection between concepts? What is particularly problematic for Millikan is that selection can act on concepts only if there is a difference in the concepts. Selection requires differentiation; there is nothing to cause selection for C rather than D as a pointer to mice if C and D are intrinsically identical. However, if C and D are not intrinsically identical, then they must be more than mere pointers. Thus the answer that selection operates on concepts helps only at the cost of giving up Millikan's nondescriptivism. There is another, perhaps less dear, cost as well. Although we may wish to grant that some concepts are selected for – say, the concept of predator or the concept of cliff – it cannot be that all concepts are selected for. Being selected for means that a concept is innate, and there are some things to which thinkers today are able to point that could not have been pointed at by thinkers long enough ago in our evolutionary history for selection to have occurred, such as lunar modules, plutonium, and basketballs.

(4) Instead of being for concepts, Millikan might suggest that the selection is for the cognitive system that produces concepts by responding to certain features of the thing to be pointed at. When it fails to respond to those features in the way in which it was selected to do, it makes a mistake and generates the incorrect concept. C might thus be mistakenly tokened in response to an elephant (a large grey mammal, rather than a small grey mammal). However, this too makes concepts more than mere pointers. If the cognitive system that causes concepts to be tokened causes a particular concept to be tokened as a result of what the object pointed at is like, then the concept itself carries information about what that object is like. It is descriptive. The problem is that, for the cognitive system to be making a mistake in producing a particular concept in response to a particular object, there must be some norm stipulating which concept is generated. However, that requires a difference in concepts, something Millikan cannot afford at the initial production of a concept, for that would mean giving up her nondescriptivism.

(5) Another way to make this point is that, for Millikan's proposal to be a genuine alternative to descriptivism, the link between a concept and the object to which it points must be arbitrary. Perhaps then C points to mice because the first thing it pointed to was a mouse. This has the advantages of being arbitrary and of not requiring that the norm for production of C be established ahead of time. But, as Quine (1960) taught us, in that one instance, C pointed to many things, not just a mouse. Nor does it help to suggest that on repeated instances C was most often tokened in response to mice. In addition to leading to the problems discussed in (2) above, this also requires us to be right a majority of the time in our application of concepts, a requirement that is too strong, especially for young children.

(6) A similar possibility, one that brings together the initial arbitrariness of concepts and the appeal to evolution that Millikan makes, is that C points to mice because, by pointing to mice, C makes the thinker more fit. But this rules out the possibility of having a concept that makes a thinker less fit, and surely it is possible to have such a concept.

(7) Finally, perhaps concepts are innate, but this has the difficulties suggested above in (3). We would not be able to point at things that are new additions to the world, and concepts would no longer be arbitrary, which means giving up antidescriptivism.

The possible answers to (Q2) are similar to the answers to (Q1) (with one notable exception, discussed below), and they have similar problems. Millikan can either claim that there is something about C that makes it more suited than D to be the concept pointing to mice (for example, that C was selected for this task, or that the cognitive system responsible for producing concepts malfunctioned when it produced D, or that C is the innate concept that points to mice) or that by some arbitrary means C, not D, has been determined to be the concept that points to mice (for example, C was the first concept to point to mice). The former sort of response gives up nondescriptivism by making the relation between C and mice nonarbitrary, thus making C more than a mere pointer. The latter sort of response avoids this problem but at the cost of making the relation between C and mice too arbitrary, so that maintaining the relation requires unrealistic stipulations (such as, the first few times a child tokens C, it is doing so correctly).

Notice also that there are problems peculiar to (Q2). For example, Millikan might wish to claim that the first time an object is pointed to, the concept that points to the object does so correctly (the corollary to [5]), but this would have the consequence that, if C is tokened the first time a mouse is seen (and thus points to mice) and then later tokened the first time a giraffe is seen, it correctly points to both giraffes and mice. On the other hand, Millikan might wish to bite the bullet and allow that both C and D correctly point to mice. She might allow that they are both concepts that point to the same objects; after all, there is nothing theoretically incoherent in that position. However, the consequence of this bullet is that anything learned about D-mice will not translate to something learned about C-mice. Presumably, at some point the thinker will realize that he has two concepts pointing at the same thing and will then combine the D-knowledge and C-knowledge. An explanation of how this might occur is warranted.

What we need is an explanation of how concepts get attached to the objects to which they point, but the explanation cannot assume that there are intrinsic differences in concepts (on pain of giving up nondescriptivism) or that the link between concept and object is completely arbitrary (on pain of making mistakes in tokening a concept impossible).

The common structure is the affordance in the ecology

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Abstract: Millikan's discussion of substance concepts in terms of their information-gathering role ignores the analyses of information-based perception and action developed within the tradition of ecological psychology. Her introduction and use without definition of key Gibsonian terms such as "affordance" and "direct perception" leaves those of us investigating such concepts uncertain of the extent to which she appreciates their theoretical importance. Due recognition of the realist account of categorical perception developed by J. J. Gibson would provide mutual benefit to modern externalist philosophy as well as to experimental psychology and to those investigating the ecological approach to perception-action.

Millikan's (1998t) analysis of the common structure of concepts addresses the critical issue of how concepts can be grounded, that is, how they can indicate things and acquire conceptual content. Although central to her argument against descriptionism, the issue of concept grounding warrants further emphasis in terms of the coordination of perception and action as a basis on which linguistic and conceptual mechanisms can be built. In particular, Millikan's suggestion that substance concepts are based on the direct perception of affordances of the environment via the detection of informational invariants, although central to her argument, is quite undeveloped.

As stated by Millikan, substances are grasped not on the basis of how the component parts of their extensions are joined together with "mental-glue," but rather on the basis of how an actor can exploit the substance for action. In Gibson's ecological approach to perception and action, real properties of the world are likewise indicated by specificational information that an animal can explore, attune to, and detect (Gibson 1979/1986). Things and events in the world are considered to be perceived on the basis of structured energy distributions (i.e., higher-order optical properties) that are detected by appropriately attuned (neural) processes that can come to harness the detected information for the guidance and constraint of movements and actions. Therefore, fundamentally, perception both permits and requires exploratory action. This continual interplay between active exploration and perception has been dubbed the *perception-action cycle* and is considered as the basis for the direct apprehension of the meanings or the affordances of the world (Gibson 1979/1986; Reed 1996; Schmuckler & Kennedy 1997).

Arguably, the basis for the coordination of perception and action are Gibsonian higher-order invariants of stimulation, that is, abstract properties of optical structure such as ratios and differential invariants. These have been empirically identified by visual psychologists as constituting the epistemic foundation for our knowledge of the real affordances of a real world. Sensations or the neural events occurring at a receptor surface are mere side effects of detection and are thus irrelevant to an explanation of meaningful perception. In particular, it is optical invariants alone that can specify the invariant aspects of things regardless of how the perspectival structure changes (as emphasized, e.g., by MacClenan 1998). Millikan's discussion of the fallibility of identification across time exploits a trap that nonecological psychologists and nondirect perception theorists repeatedly encounter, namely, the assumption that object definition must be a function of constructive (descriptionist, conceptual) mechanisms that, given a varying input, produce as output an internal representation of invariance. Of course, the momentary visual perspectives of a family member that one obtains over time will vary, but such variance is necessary to reveal the underlying invariance. The latter can specify the person and permit not only identification but also reidentification on repeated encounters even when presented with a partial "snapshot" (e.g., a shoulder).

When Millikan states that the purpose of a substance concept is "facilitating information gathering and use for an organism navigating in a changing and cluttered environment" (sect. 3, para. 8), one would like to ask in exactly what way her theory of concepts differs, if at all, from the existing and arduously worked out theory of information-based perception-action initiated by Gibson (1979/1986) and extended by Gibsonians (e.g., Reed 1988; Schmuckler & Kennedy 1997; Turvey et al. 1981) or the mechanisms of coordination dynamics that some believe might implement perception-action behavior without relying on internal representations (see, e.g., Kelso 1995; Treffner 1997; Turvey 1990). According to an ecological and dynamical framework, perception without conception is possible and indeed necessary if organisms are to be subject to the mechanisms of natural selection that provide for an organism's ability to veridically perceive and anticipate the meaningful affordances of its environment (Balzano & McCabe 1986; Reed 1988; 1996). Thus Millikan's notion of conceptual grounding seems quite similar to that of the Gibsonian approach, although she nowhere admits or addresses this possibility.

Because Millikan's stance on conceptual structure, as with other contemporary perspectives on mental content (see, e.g., Dretske 1995), is both realist and externalist, her perspective is of considerable interest to ecological psychologists. Like Millikan (1984), proponents of the ecological approach have emphasized the evolutionary embeddedness of cognition. Ecological psychology has made considerable efforts to build a consistent theory of cognition based primarily on active perception and only secondarily on natural language (Reed 1997b; Turvey et al. 1981). Millikan's externalism shows that the mind simply "ain't in the head" and is com-

patible with the thrust of the ecological approach; for direct perception theory, the “inputs” for cognitive mechanisms are not mere forms and shapes on the retina that have to be imbued with meaning through “information processing.” Rather, the “inputs” to the perceptual system, at the very least, are inherently meaningful opportunities for action taken with reference to the organism, what Gibson called “affordances.” Unfortunately, Millikan has casually introduced the terms “direct perception” (sect. 6) and “affordance” (sect. 3) with no preamble regarding the origins and ramifications of such theoretical terms, let alone a working definition. Although “direct perception” may be a term that historically has been used outside of exclusively Gibsonian circles, an “affordance,” because of its careful technical definition in the literature, deserves far closer attention than the glib usage employed by Millikan. Indeed, this concept has provided for much debate by Gibsonians and non-Gibsonians alike, so there is obviously something of great significance in it (see, e.g., Turvey et al. 1981).

Consider two examples of information-based perception–action that illustrate how an appreciation of affordances can explain categorical perception. Investigations on affordances (e.g., Warren 1995) have shown that critical boundaries exist that constrain our actions, for example, the boundary between the maximal stair height that can be stepped-up upon and a stair that cannot. The critical boundary is defined as a higher-order invariant of the organism–environment system. Thus, for both short and tall people, the same ratio of riser height to leg length (.88) specifies a critical boundary of action possibilities (affordances) in body-scaled terms. Furthermore, individuals directly perceive these categorical boundaries on the basis of eye height–scaled information and act accordingly (Warren 1995). As another example of the direct perception of categorical boundaries without invoking conceptual mechanisms, crawlers and walkers can be said to perceive a wobbly waterbed surface as either affording or not affording crossing (Gibson 1987; Gibson et al. 1987). Young crawlers (of age 10 months) will readily crawl across the surface to their mothers, but older walkers (of age 14 months) will not attempt to walk across. The reason is that crawlers perceive the surface as affording crossing, but the walkers do not perceive it as affording crossing; it is far too unstable for walking, but not for crawling. In terms of an affordance-based interpretation, the two infants necessarily see a different world. They both grasp a different meaning of what is nominally the same physical situation, because the meaning grasped is specific to their own particular action capabilities. One need not assume that the infants conceive of the environment differently. Rather, the perception of meaning (crossable vs. uncrossable) occurred via the detection of an optical invariant that specified surface stability and this invariant in turn was coextensive with the affordance (the meaning) of crossability.

Recent research indicates that a dynamics of stability and coordination may provide insight into the dynamical mechanisms that underlie the perception of affordances (Treffner & Kelso 1999; Treffner & Turvey 1996). The full coordination dynamics to be defined in the preceding example would include variables related to the child, the surface, and the optical properties that couple them (Kelso 1995; Thelen & Smith 1996). Hence, in agreement with Millikan, a purely descriptionist account of conceptual structure is completely inadequate for explaining coordinated perception and action. The example illustrates that the child’s perceptual content is also determined by externalist considerations. But the content is also child-referent in the ecological sense that the affordances of the environment require consideration of properties of the organism for their individuation (e.g., shape, size, scale, and ability). Perhaps some serious consideration by Millikan of the extensive pool of empirical data on affordances and their informational specification (see, e.g., Schmuckler & Kennedy 1997), together with the rich theoretical framework developed by ecological psychologists (e.g., Reed 1996), would mutually benefit our respective investigations into the basis of an organism’s epistemic contact with its environment.

Author’s Response

On sympathies with J. J. Gibson and on focusing reference

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Abstract: Something of the relation of my work on substance concepts to Gibsonian theories of perception–action is discussed. What historical relations tie a particular substance concept to a particular substance is discussed.

R1. Reply to Paul Treffner

The suggestions that I offered in my target article (Millikan 1998t) were intended to concern concepts alone, indeed, to concern only one particular kind of concept, namely, concepts of “substances.” However, I realize that the distinction between cognition and perception is rather a troubled one. My own suspicion is that there are a great many factors, a great many abilities, that have to be added together, in order to move from the simplest sort of perception used for purposes of direct motion guidance, up to the level of the most complex sorts of cognition of which we humans are capable. I am in sympathy with much of the Gibsonian approach to understanding perception as used in the immediate guidance of action, but I am under no illusions that all of human cognitive activity, indeed that all of, say, even canine cognitive activity, can be understood merely as exemplifying perception–action cycles.

My passing reference to a chair as having, for a child, a “climbing-up-on affordance” was indeed a bow toward Gibson (a short philosophical defense of the notion of affordance can be found in Millikan 1996). In the context of the target article, I wished merely to call attention to the fact that substance concepts are developed not just for purposes of learning what properties substances have but for purposes of learning how to behave toward substances. To have a practical substance concept, one that is geared toward learning how rather than for learning that, is quite different from having the capacity to perceive some particular affordance. A practical substance concept, taken by itself, would not yet guide any action. What the practical substance concept does is to make it possible to *learn* how to behave in the presence of a substance, by allowing one to recognize when one is encountering that substance again. The child must be able to recognize Mama and to recognize cats if it is to learn how to behave toward either of them.

Having substance concepts, as I have described them, should be sharply distinguished, I believe, from categorical perception. To learn to recognize Mama by smell, by sight, by the sound of her footstep, by the sound of her voice, by recognizing a piece of her clothing, by recognizing her walk in the distance, by hearing her name, and so forth – to come to understand that it is the very same Mama that appears in all of these guises – is something quite other than categorical perception.

Gibson’s claim – and I believe it is right, indeed, how otherwise could I show my face at Michael Turvey’s Pub on Friday evenings? – was that there is far more constancy in

the natural information received by an organism than was formerly supposed. If one looks for the right aspect of the signals that arrive by way of the ambient energy surrounding an organism in its normal environment, one finds that there are univocal channels of information that concern various distal conditions crucial to the needs of the organism, this information arriving at the surface of the organism in the same code in accordance with the same applications of the same physical laws. That is, a surprising number of superficially different channels of information can be described as really being the same channel once one has located the right, perhaps complex, invariances in the signals.

The Gibsonian claim is that there is much more of this sort of information than had previously been supposed. Many environmental distinctions to which the animal needs to respond are presented in this manner in an unequivocal way: “The stimulus is not impoverished.” These claims are entirely compatible with my own suggestion that information concerning the identities of substances is gathered by a sophisticated animal in a variety of ways. The laws that explain how light carries information relevant to Mama’s identity are not the same as the laws that explain how smells or sounds do. Knowing how Mama smells does not enable one to recognize her voice or her walk. And although it may very well be that I can sometimes tell my daughter merely by a look at her elbow poking out from beside the armchair, and this for good Gibsonian reasons having to do with constancies maintained in the ambient light despite changing spatial relations between me and my daughter, it is also true that I sometimes identify her using other methods of tracking, for example, by having noticed it was she who walked over toward that chair a moment ago.

R2. Reply to Eric Saidel

The question that Saidel asks was explicitly addressed in my first-round Response (Millikan 1998r) in the section called “Concept individuation and focusing reference,” (pp. 94–95) so I am puzzled why Saidel finds it necessary to fabricate numerous entirely different and totally implausible possible replies to discuss instead.

Notice that it would be very peculiar for a person to reach adulthood and still be mistaking elephants for mice. It is true that we sometimes make mistakes in identifying substances, but it is also true that we typically recover and correct our mistakes. (Actually, the idea that any child would at any point in his career confuse elephants with mice is

pretty absurd. A grasp of what I called “substance templates” prevents this sort of absurdity.)

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