Rules, Reductionism, and Normativity: A Naturalistic Rejoinder

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1. Introduction

The puzzle of rule-following as brought up by Wittgenstein and developed by Kripke (1982) is widely recognized as having far-reaching implications for the philosophy of language and mind (e.g., Baker and Hacker 1984, McDowell 1984, McGinn 1984 Boghossian 1989, Kusch 2006). Furthermore, it has been developed as a philosophical foundation for the sociology of scientific knowledge (Bloor 1997, Kusch 2004). The main reason why rule-following considerations in the manner of Kripke's Wittgenstein are so philosophically powerful is because they challenge us to account for the normative aspect of attributing either rules or meanings to each other (which amounts to the same in many respects). When we say of a person that she has grasped the rules of arithmetic, the meaning of the English word 'horse' or the concept of force, we thereby hold this person to be bound by certain standards of correctness concerning future speech and thinking acts. Of course, this is just one aspect of such attributions, but it might be the one that is most difficult to account for philosophically, especially (but not only) within a naturalistic metaphysics. Indeed, naturalism about meaning is one of the main targets of Kripke's critique, in particular a view known as reductive semantic dispositionalism. This is the view that meanings are reducible to dispositions to respond in certain ways upon certain queries. What the physical basis of these dispositions may be is left open in Kripke's discussion; the crucial point is that the relevant dispositions are not themselves intentional states while grasping rules and meanings are precisely such states. Rather, intentional

states are claimed to be *reducible* to dispositions or to whatever their physical basis is.

It is not my goal here to actually defend dispositionalism, nor to argue for any form of semantic reductionism. What I would like to show instead is that a certain objection to reductionism can be handled within an appropriate naturalistic framework. The objection to be considered is that meanings cannot be reducible to anything like dispositions because to attribute meanings to someone has normative implications as to how this person *ought* to behave in certain situations, while to attribute mere dispositions to someone has no normative implications. I want to show that a semantic reductionist can handle this objection by making essentially two moves. The first move is to limit reductive aspirations to the so-called *extensional requirement*. This means that meaning predicates of the form "S means X by 'Y'" must be coextensive with whatever natural predicates meanings are said to be reducible to. The reductionist must not reproduce any other pre-theoretical or "low-brow" (see Kusch 2006, 4) intuitions that we may have in regard of meaning and normativity. Semantic normativity, whatever it is, cannot be the same after the reductionist is done with her work. This move is motivated by general considerations on reduction from the philosophy of science. The second move is to use a more sophisticated naturalistic theory of concepts than simple dispositionalism, namely a family resemblance-based view as it is supported by philosophical considerations as well as empirical research in cognitive psychology and by the history of science.

The structure of this paper is as follows. In the following section I shall briefly present the skeptical challenge concerning rules and meanings according to Kripke's Wittgenstein. In Section 3, I discuss the extensional requirement and why it is the only

reasonable constraint to be imposed on naturalistic theories of meaning in regard of the problem of normativity. Section 4 presents a naturalistic framework for concepts that is based on the idea of family resemblance (ironically also an idea from Wittgenstein) and on empirical research on concept formation in humans. In Section 5, I show how such an account can deal with a particular problem in view of meeting the extensional requirement, the so-called "mistake problem". Finally, Section 6 concludes this essay with some remarks as to how this framework might be applicable beyond simple perceptual concepts.

2. The Skeptical Challenge

Kripke's Wittgenstein challenges us to cite the facts that make meaning statements true. A meaning statement has the general form: S means X by 'Y'. Instances of this scheme are, for example, "Jones means addition by '+'" or "Smith means horses by 'horse'". An obvious answer is that Jones has grasped the rule of addition or that Smith follows a rule that connects certain tokenings of the term 'horse' to appearances of the mammalian genus *Equus*.[1] However, this answer prompts the question of what makes it so that Jones is not following a different rule that happens to give the same result for all the numbers that Jones has calculated to date, for example, quaddition[2]. Similarly, the challenge is to cite the fact that determines Smith's following the above-mentioned rule about horses or a different rule, for example, one that connects tokenings of the term 'horse' to horses if they occur before the year 2016, and to cows thereafter. Wittgenstein/Kripke rule-following skepticism claims that

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[1] Only certain tokenings count here, namely those that are uttered in an indicative, present-tense context.
[2] Quaddition is like addition so long as the numbers in the argument are smaller than some arbitrary number, say, 125. Otherwise, the quaddition function returns 5 for all pairs of numbers.

there is no fact of the matter one way or the other. In particular, there are no facts about Jones's or Smith's mental states that could determine which rule they are following.

Under the assumption that meaning statements are made true by such facts, the thesis that no such facts exist has the catastrophic consequence that all meaning statements are false and, therefore, no-one means anything by any word. This, of course, is paradoxical.

It should be noted that this paradoxical result cannot be avoided simply by claiming that, if the contrary assumption leads to a paradox, this means that there must exist meaning-constituting facts after all. For on the traditional picture that Kripke's Wittgenstein sought to reject, such facts would have to consist in the possession of certain mental states by a person. These states would determine the meaning of the terms in question. But according to Martin Kusch's recent interpretation of Kripke's *Wittgenstein on Rules and Private Language* (Kusch 2006), the gist of the whole argument is that the traditional picture of meaning-determining mental states is incoherent. In other words, this picture imposes a set of constraints on mental states that cannot all be satisfied. If this is correct, the only way of avoiding the paradox is to relax one or several of the constraints of the traditional picture. Some followers of Kripke and Wittgenstein (including Bloor and Kusch) seek to avoid this paradox by giving up the idea that meaning statements, or any statements for that matter, have truth conditions and opt for communal assertability conditions instead.

I now move to the second part on normativity and reductionism. These issues pertain to a particular attempt at a solution to the rule-following problem, which is known as

reductive semantic dispositionalism. I shall use the term 'semantic reductionism' for short.

3. Semantic Reductionism and the Extensional Requirement

Kripke himself examined and rejected a particular response to the skeptical challenge about rule-following. The basic idea of this response is that the elusive meaning-determining facts are facts about a person's dispositions to respond to certain inputs. For example, Smith's disposition to say or think 'horse' when confronted with an equine presence constitutes his meaning horses by 'horse'. Similarly, Jones's having a disposition to return the sum of x and y when queried 'x + y = ?' provides the truth-maker for the statement "Jones means addition by '+'".

Kripke's own line of objecting to dispositionalism makes use of the normativity of meaning. The basic idea is that to mean something by some term is to be committed to use this term in certain ways and not in others. If Jones really means addition by 'plus', then she *ought* to return the sum of x and y on being asked "How much is x+y?" Kripke takes this normativity to be part of the intuitive picture of meaning that he seeks to reject. Whether or not meanings are intrinsically normative is a controversial issue (e.g., Dretske 2001, Fodor 1990, Glüer 1999). However, it should be noted that Kripke is not claiming that meanings are, in fact, normative. His strategy is rather to immanently criticize an intuitive picture about meaning that Martin Kusch (2006, 4) has aptly dubbed 'low-brow meaning determinism'. Semantic normativity is a part of this picture, and if Kripke is right then it must be thrown out along with it. Therefore, all those philosophers who have challenged the thesis of semantic norma-

tivity have thereby really strengthened Kripke's case according to Kusch, even if they end up giving a different account of meaning.

Nevertheless, it is worth examining whether semantic reductionism can be defended against the normativity objection. Basically, the objection is this. By meaning something, a person is committed to certain normative standards concerning the correct use the expression in question. By contrast, merely to be disposed to respond to external stimuli in certain ways carries no such commitment. It does not follow from the fact that I am disposed to react in certain ways that I ought to respond in this way. Reductionism lacks the resources for distinguishing between correct and incorrect uses of a term or of a concept.

I think it is clear that we have here an instance of the general difficulty that philosophical naturalism faces with the phenomenon of normativity. In this case, naturalists such as Fodor (1990) or Dretske (2001) have responded by questioning the whole notion of semantic normativity. First, it can be argued that I am only committed to use words in a certain way under the condition that I have the intention of using an expression consistently, or in accordance with other people's use, or if I want to utter true assertions. Thus, there is nothing intrinsically normative about meaning. Normative standards are rather external to meanings. Second, Fodor (1990, 135-136) claims that if an expression is applied to an object in its extension then there is no *further* question as to whether this application is correct. Thus, the alleged normativity of meaning really reduces to the question of whether some object belongs to a term's extension or not, which is a matter of fact.

At this point, of course, the semantic naturalist helps himself to the notion that the reference of terms can be determinate, which Kripke's Wittgenstein denies. But remember that Kripkenstein rejects this idea lock, stock and barrel as a part of a whole intuitive picture about meaning on the grounds that it is incoherent. The naturalist is not obliged to remain true to this picture; he or she is free to retain only certain elements and to reject others. In particular, the naturalist can reject the traditional ideas associated with semantic normativity. One way of doing this is by limiting the reductive aspirations to the so-called extensional requirement.

The extensional requirement is a constraint on a naturalistic theory of meaning. It requires that whatever natural properties meanings reduce to, the corresponding meaning predicates ought to be coextensive. If the reducing properties are dispositions, then the disposition predicates must be coextensive with the meaning predicates. Just as a reminder: A meaning predicate is a predicate of the form 'S means X by Y'. This extensional requirement stands in contrast to the intensional requirement. This is the requirement that the properties of the reducing base resemble the intuitive picture of meaning that we have, for example, the picture of low-brow (pre-theoretical) meaning determinism that is the target of Kripkenstein's criticism according to Kusch's rendition. Dispositionalism, by the way, is a form of 'high-brow meaning determinism' in Kusch's taxonomy, in other words, it goes beyond pre-theoretic intuitions and offers a substantial theory of meaning. However, there is no obligation on the part of dispositionalism to reproduce all aspects of the low-brow picture in the high-brow theory. In particular, the dispositionalist can drop some of the intuitions associated with semantic normativity and declare his or her goal to be solely to meet the extensional requirement.

There is an interesting parallel here to the debate about theory reduction in the philosophy of science. In this debate, there has been much controversy over so-called "bridge principles" (Weber 1998, Chapter 9). These are supposed to provide a conceptual link between the terms of the reducing theory and those of the theory to be reduced. One question was if the reduction must preserve the full meaning of the terms of the theory to be reduced, or if it is sufficient if extensionally equivalent terms are found that belong to the vocabulary of the reducing theory. I suggest this is fully analogous to the intensional and extensional requirements in the debate over reductive semantic dispositionalism. The problem with the intensional requirement is that it makes any interesting reduction in science practically impossible. In the best cases of reduction we have, for example, the reduction of thermodynamics to statistical mechanics or optics to electrodynamics, the intensional requirement cannot be met. As Feyerabend (1962) has shown, the meaning of the term "temperature" has shifted in the transition from classical thermodynamics to statistical mechanics. Similarly, "light" and "electromagnetic radiation" differ in intension, even if the latter is restricted to the visible wavelengths. These reductions – which are among the best cases of reduction that we have in the whole of science – are at best extension-preserving (if they preserve anything at all). Therefore, the best that an aspiring reductionist can hope is to meet the extensional requirement. I will now move to the fourth part, where I want to examine directly whether the extensional requirement can be met within a reductionistic framework.

4. A Naturalistic Theory of Concepts

The question is if some predicates that represent a person's linguistic dispositions can be coextensive with meaning predicates. There is an important obstacle to satisfying this contraint that the reductionist must somehow overcome, namely the so-called "mistake problem". The problem comes in at least two different forms. The first form of the problem is that someone's dispositions to say 'horse' may sometimes be triggered by some thing that is not a horse but, say, a cow under conditions of bad visibility. If this happens systematically, it leaves the extension of 'horse' too wide (Boghossian 1989, 531). The second form of the problem is to distinguish between two scenarios: one where someone follows a rule incorrectly and another scenario where someone follows a different rule with the same result (Kusch 2006, 97). For example, what fact distinguishes between someone who means addition by '+' but systematically fails to carry when calculating instances of $n + m$ from someone who means skaddition by '+', where skaddition is like addition without carrying? I take it that these are really two sides of the same problem. This becomes obvious when we ask what fact makes the difference between Smith, who means horses by 'horse' but systematically mistakes cows for horses, namely on foggy days, from Jones, who actually means horses or cows occurring on foggy days by 'horse'. It can be argued now that Smith and Jones have the exact same linguistic dispositions, yet (intuitively) the meaning of their term 'horse' differs. This obviously violates the extensional requirement.

I want to suggest that this problem can be solved by moving from a simple view of semantic dispositions to a more sophisticated view. In other words, the reductionist must put to rest any hopes of solving the problem with the help of simple on-off dispositions. A more sophisticated view of our conceptual capacities is called for. Such

a sophisticated account cannot be based not on *a priori* considerations but must take into consideration empirical results from research on concept formation in humans.[3]

A classic study is the one by Rosch (1973). She showed that human subjects do not respond the same way to different objects that belong to the same category, for example, birds. Some objects are judged as more exemplary or representative of the category than others, for example, robins or eagles are judged to be more representative of birds than chicken or ostriches. Thus, some objects seem to lie more in the center of the concept, while others lie more in the periphery. Remarkably, subjects exhibit shorter reaction times when asked to determine the truth value of sentences that assign central objects to the category compared to peripheral objects.

These results show that concepts have a *graded* structure. Some object does not simply belong to a concept's extension, it belongs with a certain grade. The objects with the highest grade of exemplariness may be called the prototype. Prototypes possess the maximal number of features that contribute to the membership in the concept's extension. These results suggest that there are no necessary and sufficient conditions for membership in a concept's extension. There is rather a *family resemblance* between the different instances. Thus, we have here a family resemblance-

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[3] There is a fundamental problem with this move, especially if the goal of the reductionist is to counter relativism about science that is based on rule-following skepticism. The problem is that the reductionist must assume the truth (in a strong correspondence sense) of the salient empirical theories, which is precisely what relativists deny. A bad case of a *petitio principii* theatens here. I don't think there is a way around this. All that we can hope to show by philosophical means is that semantic reductionism combined with scientific realism provides a coherent metaphysical system (see Oberheim, Hoyningen-Huene 1997 and Weber 2005 on the problem of comparing metaphysical systems). However, this would already be a considerable success, as the coherence of the realist view is in dispute.

based view of concepts, which is also supported by research in the history of science, for instance, the well-known work of Thomas S. Kuhn.[4]

What are the implications of this for meaning skepticism and rule following? I suggest that it demonstrates two things: First, it is probably a mistake to think that concepts are rigid rules that connect terms or concepts with their conditions of application. Rather, concepts are highly sensitive and fine-grained capacities of the human cognitive system that classify objects not just on the basis of sufficient and necessary conditions, but by using many different features.

Second, the view of concepts as graded structures might make it possible to meet the extensional requirement, that is, to show that meaning predicates are coextensive with those predicates that describe the salient cognitive capacities. Conceptual capacities are not simple dispositions to return a certain output on presented with a certain class of stimuli. They are also not second-order dispositions to maintain one's first-order dispositions, as Coates (1997) has suggested. Rather, they are capacities that elicit a broad spectrum of responses under different conditions, depending on how representative a perceptual object is.

I suggest that such an account of concepts has the resources for solving the mistake problem. The skeptic challenges us to cite the fact that makes the difference between someone who actually means horses by the term "horse", but has made a mistake, and someone who makes no mistake but really means horses or cows on a foggy day. Under a naturalistic account of concepts such as Rosch's, we can give a

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[4] See Andersen, Barker and Chen (2006), which defends and develops further Kuhn's theory of concepts. Chapter 1 contains a discussion of the relation between Wittgenstein's idea of family resemblance and empirical research in cognitive psychology.

straightforward answer: The two persons have different prototypes and different graded structures in their conceptual capacities, even if their outward verbal behavior will be the same under many conditions. On the basis of theories from cognitive psychology, this will lead to different *predictions*, for example, concerning the response times of the two subjects when they look at an object that is more central or more peripheral for one of the subjects.

At this stage, it can be objected that this does not yet solve the mistake problem because nothing in what has been said so far brings out what makes some applications of a term correct and others incorrect. Smith, who means horses by 'horse' and goes 'Lo! A horse' every time when seeing a cow in the mist applies the term incorrectly, whereas Jones, who means horses or cows on foggy days by 'horse' and exhibits the exact same behavior (even though she may have a different prototype), applies the term correctly given what she means by 'horse'. The challenge of the mistake problem is to say what natural fact makes it so that one application is correct, whereas the other is not. Just to cite *some* fact that makes a difference between Smith and Jones is not enough; the facts must pertain to some difference that is *normatively relevant* in the sense that they distinguish between correct and incorrect uses of the term.

This problem will be addressed in the following section.

5. Tackling the Mistake Problem

The reductionist need not give up at this point; however, he or she clearly needs additional resources. I suggest that such resources are also available within a naturalistic framework. The crucial move is to stop considering concepts as *isolated* entities. On most naturalistic theories of concepts, the human cognitive system forms elaborate taxonomies where each concept has superordinate and/or subordinate concepts as well as contrastive concepts. The concept of horse, for example, will have several superordinate concepts such as 'animal' or 'living being', to name just two. This is true for a lay person in matters zoological just like for an expert in the systematics of mammals. What is more, each concept does not only have vertical relations to subordinates and superordinates, but also horizontal relations. It is here that the cows come in. Some naturalistic theories of concepts see not only relations of similarity and the corresponding prototypes as crucial, but also relations of *dissimilarity*.[5] Thus, concepts are held together not only by the perceptual features of the objects that fall into their extension, but also by those of objects belonging to a neighboring category. In the case of our horses, this means that both the similarities between actual horses and dissimilarities to, for example, cows or deer could be constitutive for the concept. This is necessary to limit the extension of a similarity class.

How is this relevant to the mistake problem? I suggest that it paves the road towards arguing that correctness/incorrectness of use of certain terms is a matter of whether they are applied to objects that form a natural category. I will say more about what I mean by this later. Now, I would like to consider how realistic the kind of scenarios

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[5] This point was central to T.S. Kuhn's naturalistic theory of concepts, which is strongly grounded in empirical psychological research such as Rosch's. As Andersen (2000) shows, this provides a solution to the so-called problem of wide-open texture that besets theories of concepts based on similarity relations. This is the problem that if the overlap of two bundles of features A B C D E and B C D E F is sufficient for membership to the same concept, there appears at first to be no reason why such a series could not be extended indefinitely. On Andersen's account, the Kuhnian theory of concepts can solve this problem by assuming that there is always a series going in the reverse direction that belongs to a contrasting category. This theory requires that there always be empty perceptual space between the bundles associated with two different categories.

that meaning skeptics have invented are, given what we known about the psychology of concept formation.

Our fictional character Jones from the normativity debate who actually means horses or cows on foggy days by 'horse' might not be *psychologically* possible, even if such a person is *logically* possible (i.e., conceivable or describable in a non-contradictive way). In other words, no-one will ever be able to form so strange a concept because it violates the principles that allow or cognitive apparatus to function in the first place. These principles require that in order to form the concept of horse, there must also be superordinate as well as contrastive concepts of things that are not horses (e.g., the concept of cow or deer) but that fall under the same superordinate concept (e.g., 'animal' or 'mammal'). This is the way our cognitive system works: it classifies things both by similarities and dissimilarities.

To this, it could be objected that anyone is free to deploy the Humpty Dumpty-principle and let their words mean whatever they want them to mean. So if someone like Jones has the concepts of horse and cow, respectively, she can form a disjunctive predicate and commit herself to mean horses or cows on foggy days by 'horse'. How does Jones now differ from Smith, who has not made this commitment but who systematically mistakes cows for horses under certain conditions? Under the naturalistic framework that is under consideration here, one could say that Jones deploys *logical operations* (namely disjunction, and also stipulation) that a 'normal' person does not when thinking about horses and cows as we normally do. Normally, we use these concepts as *simple* notions, not as complex predicates joined by logical connectives.

At this stage, it can be objected that this defense helps itself to a problematic assumption, namely that there are concepts that are simple and concepts that are complex. This response is like suggesting that the person who means addition by 'plus' and the person who means quaddition differ in that addition is a simple function while quaddition is a complex function that is introduced by using the addition function in the definiens. There is no way of making this simple/complex distinction good, a meaning skeptic will claim. Simplicity is in the eye of the beholder, and whether quaddition is defined in terms of addition or vice versa is only a matter of what is more familiar to us. Mathematically, they are perfectly interdefinable.

For the case of mathematical functions, I have to concede this objection. I do not know how to make good the notion of a simple as opposed to a complex function. Perhaps this is possible; we certainly would need to know more about how the brain computes mathematical functions. However, in the case of concepts of perceptual objects a naturalistic framework such as the one under consideration here has the resources for answering this challenge. According to this picture, concepts can only be stable if there is empty perceptual space between the feature bundles that constitute two adjacent families. Such gaps define natural families.[6] This allows us to define as complex a concept that bridges such a gap, i.e., one that involves more than one natural family. In our standard example, Jones, who means horses or cows on foggy day by 'horse' lumps together two feature bundles that are really separated by a gap. She has formed a complex category that might prove to be unstable. More encounters with relevant stimuli will cause the categories to split. By contrast, Smith,

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[6] See Kuhn (1970b). As Andersen (2000) argues, this does not presuppose a form of realism according to which the world is neatly divided into natural kinds and our concepts simply mirror these kinds. For Kuhn, what we normally call "the world" is always the product of a mutual accommodation of subject-sided and object-sided moments. However, this does imply that the object-sided is also differentiated (Hoyningen-Huene (1993, 86).

who makes a systematic mistake in the deployment of her perfectly natural catego-
ries ('natural' in the sense that they group together feature bundles that are sepa-
rated from others by empty perceptual space), merely has a propensity to respond to
certain features from across the gap between two categories. These categories will
remain stable, however, the propensity of such spill-overs across the natural catego-
ries might be decreased over time. However, in all likelihood, none of our conceptual
capacities are 100% reliable in responding only to features that form a natural bun-
dle.

Note that I have described the difference between Smith and Jones without using
any normative vocabulary (I hope). The only suspect notion I have used was the no-
tion of a natural category. Is this a way of smuggling in normativity, i.e., standards of
correct use, through the back door? I think not. On the theoretical framework that I
am considering here, the naturalness of categories is a matter of what our recogni-
tional capacities can do given the world that we interact with. While there might not
be a single, correct system of classification, "nature cannot be forced into an arbitrary
set of conceptual boxes" (Kuhn 1970a, 263). In other words, there are only so many
ways of classifying nature that will be *stable*. These are the natural categories. Other
systems will lead to anomalies, for example, to the appearance of objects that exhibit
features of two mutually exclusive categories.[7] Alternatively, new experiences might
lead to the lumping or splitting of categories. But we could define a natural category
as one that shows a sufficient degree of stability under the impact of experience.

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[7] A popular example from the history of biology is the duck-billed platypus, a creature discovered in
Australia around 1800 that showed features from both mammals, reptiles and birds. It was eventually
accepted as a mammal. However, as LaPorte (2003) convincingly argues, the concept of mammal
changed its meaning when this happened.

As these considerations show, within a naturalistic framework it is possible to avoid normative vocabulary when describing the difference between two persons whose linguistic expressions differ in meaning. What makes statements such as "Smith means horses by 'horse'" true (or false) is the presence (or absence) of a system of natural categories in Smith's cognitive system. Provided that 'horse' is a natural kind term[8], what distinguishes Smith from Jones is that the latter either lacks such a system, or is not using 'horse' as a natural kind term. Thus, the truth-makers of this type of meaning statements are natural facts about certain cognitive capacities of individuals.[9]

6. Beyond Perceptual Categories

It is clear by now that this answer to the meaning-skeptical challenge only works for a specific kind of linguistic expression, namely such terms that indicate the categories of a natural classification system. These categories must form an exhaustive but non-overlapping division of the object domain. For cases where these requirements are not met, I have nothing to say at this time.

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[8] I mean "natural kind" in a loose sense here, not in the traditional essentialist sense. I do mean to make any strong claims about the nature of biological species (most philosophers of biology doubt that species are natural kinds in the traditional sense). All I want to imply by that term is that we are dealing with a general term (as opposed to a proper name) and that its reference is some set of natural objects (as opposed to abstract objects such as numbers or virtues or social objects such as countries or money).

[9] I am not claiming that individuals can acquire such capacities independently of a community. It is even possible that a person would have acquired a different system of natural categories, had she lived in a different community (recall that, in our present framework, there are always several but not infinitely many ways of forming a natural classification system). But once a person has acquired a system of natural categories, meaning statements express natural facts about this particular person and not about the community. In principle, these facts could be recovered by inspecting the person's brain. The question of how individuals can acquire natural categories by ostension and other means is a difficult one and cannot be discussed here (see Andersen 2000).

Things are probably much more complex than this, especially if we move from simple perceptual objects to more abstract concepts such as the mathematical functions that formed the starting point for the Kripke/Wittgestein-style rule-following considerations. We simply don't know enough about what kinds of capacities ground higher-order concepts such numbers. However, interestingly, Giere (1994) has shown that scientific models can be viewed as complex predicates with similar properties as the simpler predicates studied by Rosch. I see no reason in principle why second-order concepts such as the concept of evidence should not have a similar basis. This might offer the resources for countering versions of social constructivism about science that are based on rule-following skepticism, such as David Bloor's or Martin Kusch's.

I am not claiming that these considerations solve all the problems that a semantic naturalist faces. For example, it still needs to be shown that, under such a naturalistic semantics, the reference of terms is determinate. However, I would like to claim that such considerations on the basis of cognitive psychology as I have presented reduce the plausibility of the skeptical claim that naturalistic theories of meaning cannot satisfy the extensional requirement. This claim is based on far too simple a notion of our conceptual capacities, namely a notion of dispositions that are either manifested or not, and that have only one kind of manifestation. Note also that even if a view of concepts such as Rosch's should be refuted by empirical research in cognitive psychology, the claim that naturalistic theories of meaning can't meet the extensional requirement is weakened. It is enough to give a coherent naturalistic account of meaning that makes it conceivable that the extensional requirement can be met to undermine the skeptical thesis that this is impossible in principle.

To conclude, it would be quite ironical if a Wittgensteinian account of concepts based on relations of similarity and dissimilarity instead of necessary and sufficient conditions would offer resources for countering Wittgensteinian rule-following skepticism.

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