Disagreement in Scientific Ontologies

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Abstract The aim of this article is to discuss the nature of disagreement in scientific ontologies in the light of case studies from biology and cognitive science. I argue that disagreements in scientific ontologies are usually not about purely factual issues but involve both verbal and normative aspects. Furthermore, I try to show that this partly non-factual character of disagreement in scientific ontologies does not lead to a radical deflationism but is compatible with a ‘‘normative ontological realism.’’ Finally, I argue that the case studies from the empirical sciences challenge contemporary metaontological accounts that insist on exactly one true way of ‘‘carving nature at its joints.’’

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Not every disagreement is a factual disagreement about reality. Suppose, for example, that two Egyptologists debate whether the Pyramid of Djoser is extraordinarily tall. They both know that the height of the pyramid is 60 m and agree that this makes it the ninth tallest pyramid in Egypt. One Egyptologist argues, however, that the Pyramid of Djoser is not extraordinarily tall because it is not even half as tall as the Great Pyramid of Giza. The other Egyptologist insists that this is irrelevant because a building that is older than 4,000 years and 60 m tall is obviously extraordinarily tall. It seems obvious that the disagreement between the Egyptologists is merely verbal in the sense that they do not disagree about the pyramid but about what it means to be ‘‘extraordinarily tall.’’ Of course, compared with the Great Pyramid of Giza the Pyramid of Djoser is not extraordinarily tall. Compared with other buildings of that time, however, the Pyramid of Djoser was obviously extraordinarily tall. Furthermore, the dispute seems to be merely verbal no matter whether it is recognized as merely verbal. It may happen that both parties are stubborn and not willing to dissolve their dispute by accepting that there are different possible definitions of ‘‘extraordinarily tall’’. Instead, they insist that the Pyramid of Djoser really is (not) extraordinarily tall. However, the unwillingness to admit the verbal character of the dispute does not seem to change anything about the involved disagreement being merely verbal.

Recent debates about the nature of philosophical disagreement (e.g. Hirsch 2011; Chalmers 2011) raise the suspicion that metaphysical disagreements are often similar to the pyramid case. Although few philosophers follow positivists and anti-metaphysicians in rejecting all metaphysical disagreements as merely verbal, many suspect that metaphysics is especially vulnerable to linguistic confusion that results in elaborate but still merely verbal disputes. This is especially evident in contemporary metaphysical debates about topics such as mereological sums, wholes and parts, four-dimensional objects, and so on (see, e.g. Chalmers et al. 2009 for different examples).

Contrary to these metaphysical issues, scientific disputes seem to provide the most uncontroversial examples of factual, non-verbal disagreement. Scientific disagreement is disagreement about what is the case in the world and it is usually empirically resolvable through scientific research. Of course, there can be also misunderstandings and merely verbal disagreements among scientists but they are usually easily clarified (‘‘oh, I thought you meant kilometers and not miles!’’). While there is certainly some truth in this characterization of scientific disagreement as factual disagreement, it is also too simplistic to capture the actual diversity of disagreements in scientific practice.

The aim of this article is to discuss different examples of disagreement in scientific ontologies as well as their consequences for a general understanding of ontological disputes. I will argue that disagreement in scientific ontologies turns out to be considerably more complex than the characterization of scientific disagreement as factual disagreement suggests. Disagreement in scientific ontologies is usually not ‘‘purely factual’’ but it is not ‘‘merely verbal’’ either. Instead, I will argue that it is at least partly normative in the sense that it reflects explanatory interests and even non-epistemic values of scientists. Furthermore, I want to argue that these normative and non-factual aspects of disagreements in scientific ontologies do not threaten a moderate realism about scientific entities. Instead, the considerations of this article lead to what I want to call ‘‘normative ontological realism’’. Although scientific ontologies are shaped by explanatory interests and values, they still refer to features in the world that are independent of their conceptualizations. Finally, I want to argue that this account of disagreement in scientific ontologies challenges meta-ontological positions that assume that any serious ontological realism is committed to the idea of exactly one fundamental way of ‘‘carving nature at its joints.’’

1 Three Examples of Biological Disagreement

Scientific disagreement is often considered a prototypical case of purely factual and therefore non-verbal disagreement. Scientists disagree about what is the case in reality and their debates are usually empirically resolvable. However, the characterization of scientific disagreement as ‘‘purely factual’’ obscures the diversity of scientific disagreements. This section will present three examples of biological disagreements that are not entirely factual and lead to a more systematic account of disagreement in scientific ontologies. First, consider a dispute between proponents of the following claims:

(1) There are dandelion populations in the tropics.
(2) There are no dandelion populations in the tropics.

The disagreement between a proponent of (1) and a proponent of (2) seems to be a perfect example of purely factual and also empirically disagreement. However, the situation can turn to be more complicated because there are different plausible interpretations of (1) and (2). On the one hand, ‘‘dandelion’’ is often taken to refer to a Taraxacum officinale, a species native to Eurasia and naturalized throughout other temperate regions. Given this interpretation, the claim that there are dandelion populations in the tropics is wrong. On the other hand, ‘‘dandelion’’ is often taken to refer to the large genus Taraxacum which includes T. officinale, but also other species that are native to tropical regions. Given this interpretation, the claim that there are dandelion populations in the tropics is true. The lesson is that it depends on the context whether debates about questions such as (1) versus (2) are merely verbal or not: if one biologist refers to T. officinale while the biologist refers to the genus Taraxacum, the debate turns out to be merely verbal. If both of them refer to T. officinale (or to the genus Taraxacum), the debate turns out to be factual.

Although the case of (1) versus (2) shows that scientific disputes can be merely verbal disputes, the example also seems to be rather superficial. Of course, there can be misunderstandings in scientific communication as much as in everyday communication. However, as soon as the biologists clarify whether talk about the genus Taraxacum or about T. officinale, the misunderstanding disappears or the disagreement between proponents of (1) and (2) becomes a perfect example of a factual disagreement. If non-factual aspects in scientific disagreement were limited to simple misunderstandings, we could indeed characterize scientific disagreement as factual disagreement without the need for any complicated qualifications. Let us therefore turn to the next example of biological but not purely factual disagreement.

(3) There are fish that weigh more than 200 tons.
(4) There are no fish that weigh more than 200 tons.

At first, the dispute between proponents of (3) and (4) also seems to be a prototypical case of factual and non-verbal disagreement. Either there are fish that weigh more than 200 tons or there are no fish that weigh more than 200 tons. Furthermore, the debate seems to be easily resolvable: blue whales are the only animals that can weigh more than 200 tons. Blue whales are mammals and not fish. Therefore (3) is false and (4) is true. However, we can make the situation more complicated by introducing a proponent of (3) who claims that whales are fish. Consider, for example, Ishmael’s famous speech in Melville’s Moby Dick (see also Chalmers 2011, 518):

> Be it known that, waiving all argument, I take the good old fashioned ground that the whale is a fish, and call upon holy Jonah to back me. This fundamental thing settled, the next point is, in what internal respect does the whale differ from other fish. Above, Linnaeus has given you those items. But in brief, they are these: lungs and warm blood; whereas, all other fish are lungless and cold blooded (Melville 1851/ 2007, 137).

Ishmael knows that fish share certain biological features with mammals but he is not especially interested in these similarities. For him, the similarities between whales and fish are much more important and that’s why he insists that whales are fish. If we consider both Ishmael’s concept of fish and the Linnaean concept of fish acceptable, the dispute turns out to be verbal. Given Ishmael’s definition, (3) is true and given the Linnaean taxonomy, (4) is true. Whether (3) or (4) is true is not an empirical question but solely depends on the definition of ‘‘fish.’’

However, one may wonder whether Ishmael's concept of fish and the Linnaean concept of fish are actually both acceptable. Haven't biologists discovered that whales are mammals and isn't Ishmael simply wrong in claiming that whales are fish? If so, the diagnosis of a verbal dispute would again become doubtful. If biologists have actually discovered that whales are mammals, we would have to argue that Ishmael is wrong about (3) because he is wrong about the very nature of whales.

The question whether the disagreement about fish is verbal or factual leads to general issues regarding the nature of biological taxonomies. Is there just one correct biological taxonomy that is discovered by biologists or can there be different but equally acceptable taxonomies that reflect different interests? Although some philosophers of biology such as John Dupré have defended everyday taxonomies that consider whales to be fish (Dupré 1981, pp. 75–76), many philosophers will be inclined to consider Ishmael's position to be simply wrong and to claim that Ishmael's concept of fish does not refer to a natural kind.

This invocation of natural kinds suggests that disagreements about biological taxonomies are purely factual disagreements: biological taxa refer to natural kinds that are discovered in nature and natural kinds determine the correct answer in disputes about biological taxonomies. Unfortunately, it is highly doubtful that this notion of natural kinds is tenable in the light of actual taxonomical disputes in biology. Even if we conclude that Ishmael's concept of "fish" fails to refer to a natural kind, there are still other cases in which the interpretation of taxonomical disputes as purely factual runs into trouble. Consider, for example, a dispute about the following claims:

(5) There is just one tiger species.
(6) There are different tiger species.

Most contemporary biologists will insist that there is only one tiger species, Panthera tigris. However, there are also several subspecies such as the Bengal tiger (Panthera tigris tigris) and the Sumatran tiger (Panthera tigris sumatrae). How do we know that they do not constitute different species? Given traditional morphological species concepts, the distinction between species and subspecies is a notoriously tricky issue. Traditional taxonomies distinguish different species along morphological features: whether two populations belong to the same species is decided on the basis of shared morphological properties. This proposal raises obvious questions: which morphological properties are essential for the distinction between different species? Why aren't the morphological differences between the Bengal tiger and the Sumatran tiger sufficient to constitute different species?

Contemporary biologists usually avoid these problems by rejecting morphological species concepts and adopting alternative accounts such as Ernst Mayr's classical biological species concept. According to Mayr (1963, 21), species are groups of interbreeding populations and the central criterion for species membership is the ability to produce fertile offspring of both sexes. As Bengal tigers and Sumatran tigers are able to produce fertile offspring of both sexes, the biological species concept implies that they belong to the same species. Given the biological species concept, there is only one tiger species and (5) is true.

However, Mayr's proposal is not the only alternative to a morphological species concept. Among the many proposals is the so-called phylogenetic species concept, which defines species as "the smallest diagnosable cluster of individual organisms within which there is a parental pattern of ancestry and descent" (Cracraft 1983, 170). Bengal and Sumatran tigers are different clusters in this sense and proponents of the phylogenetic species concept are therefore committed to (6) (LaPorte 2004, 70–76).

Given the biological species concept, there exists just one tiger species and given the phylogenetic species concept there exist different tiger species. How shall we understand this disagreement? One option is to endorse a notion of natural kinds that is strong enough to make this disagreement purely factual. Biologists simply have to figure out what natural kinds exist in order to determine which species concept is the correct one.

Unfortunately, this suggestion does not seem credible in the light of actual biological practice and misunderstands the epistemological situation of debates about biological taxonomies. It is not the case that biologists do not have enough information to identify the fundamental biological kinds but they rather have so much biological information that they have come up with a variety of interesting species concept. Indeed, one could hope only one of these species concepts qualifies as a natural kind because it is clearly superior to all other proposals. Unfortunately, this is not the case as any evaluation of species concepts will depend on the explanatory interests of the involved biologists.

Mayr's biological species concept, for example, became an extraordinary success in the second half of the twentieth century because it solves many of the problems of a traditional morphological species concept. While morphological criteria are often not sufficient to clearly distinguish between species and sub-species, the biological species concept offers a rather clear criterion, i.e. the ability to produce fertile offspring of both sexes. Furthermore, the explanatory achievements of the biological species concept are uncontroversial in many areas of biological research. One often discussed example is the case of sibling species of Anopheles mosquitoes which were not distinguishable as different species on morphological or ecological grounds. Only by applying the biological species concept and distinguishing between these species, it was possible to understand the distribution of malaria (Mayr 1963; cf. Kitcher 1984; Stanford 1995). Despite this success, the biological species concept also faces difficulties. For example, it cannot be applied to asexual species unless one is willing to accept that asexual individuals do not belong to species at all. Furthermore, other species concepts can also claim explanatory achievements that would not be possible under the assumption of the biological species concept. Kitcher (1984) makes this point by contrasting the biological species concept with an ''ecological species concept'' that defines species as lineages that share ecological niches (Van Valen 1976):

> I have already remarked on the way in which the biological species concept illuminated the issue of the distribution of mosquitoes in the Anopheles maculipennis complex. Yet it should be evident that distinction according to reproductive isolation is not always the important criterion. For the ecologist concerned with the interactions of obligatorily asexual organisms on a coral reef, the important groupings may be those that trace the ways in which ecological requirements can be met in the marine environment and which bring out clearly the patterns of symbiosis and competition (Kitcher 1984, 124).

Similar points can be made by comparing the biological and phylogenetic species concept. The phylogenetic species concept postulates more species than the biological species concept as there can be diagnosable clusters of organisms in populations that are able to interbreed. This narrowness of the phylogenetic species concept will be desirable for some biologists as it leads to a fine grained description. For example, biologists who mostly work in laboratories may prefer the phylogenetic species concept over alternative accounts. At the same time, some field workers may find it useless as species membership would become undeterminable to them (LaPorte 2004, 74).

The different examples lead to the same conclusion: what counts as the best species concept depends on the explanatory interest of biologists. And if there is a plurality of equally legitimate explanatory interests in biology, then there will be also a plurality of equally legitimate species concepts. Given a plurality of equally correct species concepts, disagreements such as (5) versus (6) should not be understood as completely factual. Given the conceptual choices of the biological species concept, (5) is correct and (6) should be rejected. Given the conceptual choices of the phylogenetic species concept, (6) is correct and (5) should be rejected.

2 Factual, Merely Verbal, and Normative Disagreement

Taxonomical decisions have to be evaluated in the light of diverse explanatory interests. Furthermore, a diversity of interests leads to a diversity of different but equally acceptable taxonomies. The consequences for biological ontologies are straightforward: if there is not just one fundamental biological taxonomy, then there is also not just one fundamental biological ontology as biological taxonomies define what kind of biological entities exist. Proponents of different taxonomies postulate the existence of different taxa and therefore different biological ontologies.

The claim that there is not just one fundamental biological taxonomy is not a new result but has been a constant theme in the ‘‘species debate’’ since the 1980s (e.g. Dupre´ 1981; Kitcher 1984). However, the discussion also raises the question what these examples imply about scientific ontologies in general and what we can learn from them regarding con-temporary metaontological debates that rarely consider results from biology. One way of connecting the examples with contemporary metaontology is to interpret them as case studies of what Putnam has dubbed ‘‘conceptual relativity,’’ i.e. the claim that we can describe the same reality in terms of different but equally fundamental conceptual frameworks. Here is one of Putnam’s illustrations of conceptual relativity:

> Suppose I take someone into a room with a chair, a table on which there are a lamp and a notebook and a ballpoint pen, and nothing else, and I ask, ‘How many objects are there in this room?’ My companion answers, let us suppose, ‘Five.’ ‘What are they?’ I ask. ‘A chair, a table, a lamp, a notebook, and a ballpoint pen.’ ‘How about you and me? Aren’t we in the room?’ My companion might chuckle. ‘I didn’t think that you meant I was to count people as objects. Alright, then, seven.’ ‘How about the pages of the notebook?’ (1988, 110).

The point of Putnam’s example is that ordinary language allows different descriptions of the imagined room. In some situations we might be inclined to count people as objects; in other situations we focus only on inanimate things. In some situations, we might count individual pages as objects, whereas in others this may not occur to us. One way or another, our ordinary language allows us to describe Putnam’s room in different but still equally correct ways.

The philosophically interesting question is not whether something like conceptual relativity exists but rather what the scope of conceptual relativity is. Few philosophers would deny conceptual relativity in the case of everyday language and Putnam’s room. However, in the case of philosophical and scientific ontologies, conceptual relativity becomes highly controversial and many disputes in contemporary ontology presuppose that there is just one fundamental description of reality, just one objectively correct way to ‘‘carve nature at its joints.’’ The suggested interpretation of the species debate can be understood as a claim about the scope of conceptual relativity. Conceptual relativity is not limited to everyday examples but extends to debates about biological ontologies.

If disagreement is diagnosed as being based on conceptual relativity, it is also diagnosed to be at least partly non-factual. The very point of conceptual relativity is to interpret conflicting statements as not making different claims about reality but offering different suggestions of how to conceptualize reality. If the species debate is an example of con-ceptual relativity in the empirical sciences, then it also offers an example of an at least partly non-factual disagreement in the empirical sciences.

The claim that disagreement about scientific ontologies is at least partly non-factual raises the question how we should understand its non-factual aspects. One option is to understand disagreement about scientific ontologies as merely verbal disagreement. In a very broad sense it may seem trivial that the species debate also involves verbal dis-agreements regarding the conceptualization of the biological realm. However, the diag-nosis of a merely verbal disagreement usually comes with some additional claims. First, a merely verbal disagreement is often understood as a disagreement that is solely based on verbal issues and has no factual component whatsoever. For example, the dispute about dandelion populations may turn out to be merely verbal in this sense. Two botanists could agree on all factual issues but refer to different taxa when they use the word ‘‘dandelion’’. One biologist refers to the genus Taraxacum while the other refers to the species T. officinale. This dispute would be merely verbal as it would solely depend on the different uses of the word ‘‘dandelion’’.

Second, merely verbal disagreements can be understood as failed attempts to discuss factual issues. As a consequence, merely verbal disagreements are pointless and disappear as soon as their nature is clarified (e.g. Cohnit and Marque 2013). This distinguishes them from verbal disagreements in which both parties know that they are debating a verbal issue and intend to debate a verbal issue (see Jenkins 2013). The dandelion example involves merely verbal disagreement as the botanists intend to debate a factual issue but fail to do so due to their conceptual confusion. Furthermore, their disagreement disappears as soon as the conceptual issues are clarified.

Disagreements in scientific ontologies often exhibit neither of these features of merely verbal disagreements. Let me illustrate this point with an example from psychology instead of biology. In 1904, British psychologist Charles Spearman published an article in which he introduced factor analysis as a method to ‘‘objectively measure’’ intelligence (Spearman 1904). According to Spearman, the positive correlations between different cognitive abilities indicate the existence of a general intelligence factor. Spearman’s assumption of a general intelligence factor was soon criticized by psychologists such as Louis Leon Thurstone as a misinterpretation of psychometrical data. Thurstone argued that a more satisfying interpretation of intelligence tests would not assume one general intelligence factor but several primary mental abilities such as verbal comprehension or numerical ability (Thurstone 1938). The question whether there exists a general intelligence is not only of historical interest but continues to polarize psychologists. Among the best known alternatives to the still popular concept of a general intelligence is Howard Gardner’s Theory of Multiple Intelligences (Gardner 1983), according to which there are multiple intelligences such as a linguistic, mathematical, or musical intelligence.

The debate about the number of intelligences offers typical examples of disputes about psychological ontologies that are concerned with the question what psychological entities exist. Furthermore, it is attractive to interpret these disputes in analogy to the species debate and to claim that they also involve conceptual choices that reflect different explanatory interests. As much as there is not just one objectively correct biological taxonomy, there is also not just one objectively correct taxonomy of the human mind.

Although the dispute about the number of intelligences may turn to be at least partly non-factual, it would be misleading to describe the involved disagreement as ‘‘merely verbal’’. First, the dispute about the number of intelligences is not only about conceptualizations but entangled with a wide array of factual disagreements. For example, Howard Gardner has based his theory of multiple intelligences on evidence from different disciplines such as neurology, evolutionary theory, psychometrics, or developmental psychology (see Gardner 1983, 62–66). Much of Gardner's empirical evidence has been challenged by proponents of a general intelligence concept who disagree with Gardner on many empirical issues. These empirical issues are clearly entangled with the question what account of intelligence will best meet the explanatory interests of psychologists. For example, the lack of a neural correlate of general intelligence can weaken the usefulness of a general intelligence concept at least for researchers who are mostly concerned with issues at the intersection of psychology and neuroscience. However, findings of strong positive correlations between diverse cognitive abilities can strengthen the usefulness of a general intelligence concept at least for psychologists who are often concerned with mental ability testing. Given the entanglement of the dispute about the number of intelligences with empirical findings and explanatory interests, it would be wrong to describe it as merely verbal even if we assume that there is not only one correct account of intelligence.

A second feature of merely verbal disputes is that they are failed attempts to discuss factual issues. As soon as both parties realize the merely verbal nature of their disagreement, further disagreement becomes pointless and the issue disappears. There have certainly been disagreements in the intelligence debate that qualify as ‘‘failed attempts to discuss a factual issue’’—disputes in which both sides failed to see that they were debating a partly conceptual issue and tried to establish how many intelligences really exist. However, even if all intelligence researchers were aware of the conceptual aspects of their disputes, their disagreement would not become pointless and it would not disappear. The reason is that the disputes in the intelligence debate are connected to conceptual issues of utmost practical importance. Taxonomical decisions such as the question whether we should postulate just one general intelligence or several intelligences have important consequences for psychological research practice as well as many educational and clinical contexts. A psychologist who relies on a general intelligence ontology will ask different questions, design different studies, and even suggest different educational practices compared to a psychologist who works with multiple intelligence account.

So far, I have argued that disagreement in scientific ontologies should neither be understood as purely factual nor as merely verbal. How, then, does a positive characterization of disagreement in scientific ontologies look like? One obvious answer is that disagreement in scientific ontologies has often a hybrid status in the sense that it incorporates both factual and conceptual issues. However, there is another lesson to learn from the examples of this article: disagreement in scientific ontologies is often a normative disagreement in the sense that it is a disagreement about what conceptual choices we should make.

The normative aspects of disagreements in scientific ontologies can be illustrated with the species debate. One way of avoiding the conclusion that this debate is merely verbal is a very strong notion of natural kinds that implies that there is only one objectively correct species concept and exactly one fundamental biological ontology. I have argued that this strategy is not credible in the light of actual taxonomical disagreement that is shaped by diverse explanatory interests. However, the claim that taxonomical disagreements are not just factual disagreements does not imply that they are pointless and merely verbal disagreements. On the contrary, taxonomical decisions actually matter for scientific practice and scientists have every reason to debate the ontologies of their disciplines passionately. Of course, biologists can avoid some disagreements by accepting that researchers in different subfields have different conceptual needs. In this sense, different biological ontologies may coexist without actually generating any kind of disagreement. However, biologists in different subfields are not completely independent from each other but have to be able to communicate and to cooperate. At least in these situations there will be disagreement and it will be essentially a normative disagreement about how we should evaluate different explanatory interests.

The normative aspects of disagreements in scientific ontologies become even more obvious in the case of the intelligence debate. On the one hand, disagreement in this debate can be based on different explanatory interests in the same way as in the species debate. On the other hand, the debate about the number of intelligences is also connected to important non-epistemic issues. Gardner's theory of multiple intelligences, for example, has become tremendously popular with pedagogues who feel that the assumption of a general intelligence has proven harmful in education. Instead of classifying people along a general intelligence scale, the theory of multiple intelligences allows educators to concentrate on individual strengths and weaknesses (Chen 2004, 20–22). Furthermore, the question whether psychologists should continue to use a general intelligence concept is also often approached on basis of conflicting attitudes towards research on cognitive differences between human populations. While proponents of this kind of research often point out its potential use in public policy contexts (e.g. Herrenstein and Murray 1994, Part IV), critics consider it a dangerous platform for justifications of racism and sexism (e.g. Gould 1996).

Given these kinds of pragmatic considerations, the debate about the number of intelligences turns out to be everything but a merely verbal and therefore pointless dispute. Furthermore, the example of the intelligence debate illustrates how complex normative issues in scientific ontologies can be. In the case of the species debate, different taxonomic proposals have to be evaluated in the light of epistemic interests that are largely internal to biological research. In the case of the intelligence debate, non-epistemic (e.g. moral, educational, political) values come into play and seem to be of central importance for the choice of an ontology (a similar point is made by Kitcher 2007 about the concept of race). A comprehensive account of debates about scientific ontologies would therefore have to take a large variety of values into account and address the question of the relevance of these values for ontological choices in disciplines such as biology or psychology.

3 Normative Ontological Realism

The claim that disagreement in scientific ontologies is partly non-factual and essentially normative may raise some general philosophical worries. I have claimed that these disagreements can be understood as instances of conceptual relativity, in which there are different but equally correct conceptualizations. For example, we can use a biological ontology that recognizes just one tiger species or an ontology that postulates several tiger species. Furthermore, psychologists can use an ontology that recognizes the existence of only one general intelligence or an ontology of multiple intelligences. There is not one fundamental scientific ontology but scientists have to make ontological choices along their explanatory interests and values. Doesn't this lead to some untenable conventionalism or constructivism, according to which scientific entities are nothing but social conventions or constructions?

I think that a careful discussion of examples from the empirical sciences shows that the result is not a radical conventionalism or constructivism but something I want to call ‘‘normative ontological realism.’’ To see why taxa are more than just social conventions or constructions, it is crucial to reevaluate the normative aspect of scientific ontologies. Imagine an arbitrary biological taxonomy that is based only on weight and color. For example, midibrown is the taxa of all brown animals that weigh between 1 and 100 kg and a microblue is the taxa of all blue animals that weigh less than 10 g.

Contrary to such an arbitrary taxonomy, actual biological taxa are of considerable explanatory power. If we know that x is a member of the taxa T, we know a lot about x. Consider the common dandelion T. officinale. If we know that x belongs to the taxa T. officinale, we know that x is an asexual plant, genetically identical or almost identical to its parent plant, a ruderal species that quickly colonizes disturbed lands, and so on. The identification of an individual as a member of the taxa T. officinale allows a huge variety of inferences about that individual. Contrary to midibrown or microblue, T. officinale therefore matches the explanatory interests of scientists.

But where does the explanatory power of biological taxa come from? A very general but still helpful answer is that members of the same biological taxon have a lot of properties in common and that the identification of an individual as a member of a taxon therefore allows a whole lot of inferences. Furthermore, the shared properties form what can be called a ‘‘property cluster’’ that is the product of underlying mechanisms such as inter-breeding and causal effects of inhabiting the same niche. As Boyd (1989, 16; cf. Bird and Tobin 2012) puts it: ‘‘co-occurrence [of properties in a property cluster] is the result of what may be metaphorically (sometimes literally) described as a sort of homeostasis. Either the presence of some of the properties in F tends (under appropriate conditions) to favor the presence of others or there are underlying mechanisms or processes which tend to maintain the presence of the properties in F, or both’’.

The comparison of a pointless and artificial taxon such as midibrown and with an actual biological taxon such as T. officinale suggests that the consequence of the discussion is not an untenable conventionalism or constructivism. Members of a taxon such as T. officinale share properties (being an asexual plant, genetically identical or almost identical to its parent plant…), no matter how we conceptualize them. Furthermore, biological taxa are characterized through property clusters that are not arbitrary sets of shared properties but the result of underlying mechanisms.

The existence of property clusters that are independent of biologists’ interests and conceptualizations implies a moderate realism about biological ontologies. However, this result is entirely compatible with conceptual relativity in biology and the claim that there is not just one fundamental biological ontology. In the case of the species debate, the competing species concepts all refer to systematically interesting but slightly different property clusters. For example, the biological and the phylogenetic species concept tend to pick out slightly different property clusters as the criteria for joint species membership are more narrow in the case of the phylogenetic species concept.

Still, one may worry that the invocation of property clusters is not sufficient to justify even a moderate realism as long as one holds on to the pluralist claim that what counts as a systematically important property cluster depends on explanatory interests and maybe even non-epistemic values (e.g. Stanford 1995). Pluralism seems to imply that the existence of species is relative to explanatory interests and one may question whether interest-relative existence of species is compatible even with a moderately realist stance.

Although the worry that relative existence will lead to an unacceptable relativism is understandable, I think that it is ultimately misguided. More specifically, I want to argue that one can react to this worry with a distinction that has been very clearly formulated by Ernest Sosa: ‘‘Existence relative to a conceptual scheme is not existence in virtue of that conceptual scheme’’ (Sosa 1999, 134). Species pluralism, for example, implies that the existence of species is relative to a ‘‘conceptual scheme’’ in the sense that proponents of different species concepts answer the question what species exist in different ways. However, this does not mean that species exist in virtue of these conceptual choices. On the contrary, they exist in virtue of biological patterns that are entirely independent of our conceptualizations.

Consider the previously discussed example of tiger species. Proponents of the phylogenetic species concept argue for the existence of two tiger species, the Bengal tiger (Panthera tigris tigris) and the Sumatran tiger (P. t. sumatrae). Proponents of the biological species concept argue that there exists only one tiger species (P. tigris) because the Bengal tiger and the Sumatran tiger have the ability to produce fertile offspring of both sexes. While species pluralism clearly implies that the existence of species is relative to conceptual choices, a pluralist can still hold that species exist in virtue of biological patterns that are entirely independent of our conceptualizations. As soon as we have chosen to work with a specific species concept, the question what species exist has an objective answer that entirely depends on the structure of the biological realm. For example, the existence of one species P. tigris that includes Bengal tigers and Sumatran tigers may be relative to the biological species concept but that species exists in virtue of their ability to produce fertile offspring that is entirely independent of our conceptual choices.

4 Conclusion: Metaontological Lessons

There is an obvious but instructive tension between my discussion of ‘‘normative ontological realism’’ and the use of the label ‘‘ontological realism’’ in contemporary metaontology (e.g. Sider 2009). Ontological realism in the latter sense is often understood as the claim that there is exactly one correct way to ‘‘carve nature at its joints’’ while any kind of conceptual relativity is taken to imply an ‘‘anti-realist’’ stance (compare e.g. Jenkins 2010; Bennett 2009). Given this use of the label ‘‘ontological realism’’, this article proposes a hard-line anti-realism regarding scientific ontologies. I do not want to start a verbal dispute about conflicting uses of ‘‘ontological realism,’’ but I think that the discussion of scientific ontologies provides some interesting challenges for contemporary metaontology. More specifically, I want to argue that an adequate understanding of scientific ontologies challenges the underlying motivation of the absolutist interpretation of ontological realism that rejects any kind of conceptual relativity as untenable anti-realism.

Maybe the most important motivation for an absolutist interpretation of ontological realism is the worry that anything less will ultimately fail to provide any stable realism. This attitude is clearly expressed in Ted Sider’s thought-provoking Writing the Book of the World: ‘‘The realist picture requires the ‘ready made world’ Goodman (1978) ridiculed; it requires the world to really be as physics says; it requires objectivity; it requires distinguished structure. To give up on structure’s objectivity would be to concede far too much to those who view inquiry as being merely the investigation of our own minds’’ (Sider 2012, 65–66). Everything less will lead us to what Sider nicely summarizes as ‘‘Goodmania:’’ if there is no ready made world, then ontologies will turn out to be relative to our conceptual decisions and we’ll make the existence of even the most fundamental entities a matter of our own minds.

The discussion of actual ontological disputes in the empirical sciences proves this choice between a ready made world and Goodmania as too simple. Biological and psychological ontologies also depend on explanatory interests and even non-epistemic values of scientists but that does not mean that they only depend on these factors. Debates about scientific ontologies are clearly not merely ‘‘investigations of our own minds’’—even if entities such as species exist relative to conceptual choices they exist in virtue of a biological reality that is independent of our conceptualizations. For example, members of a species such as T. officinale share properties such as being asexual, genetically identical or almost identical to its parent plant, a ruderal species no matter how we describe them and no matter what scientists are interested in.

Conceptual relativity in scientific ontologies does not imply Goodmania. The result is challenging for contemporary metaontology as it undermines a crucial motivation for absolutist interpretations of ontological realism that exclude conceptual relativity and insist on exactly one fundamental way of carving nature at its joints. Although it is logically consistent to accept conceptual relativity in the case of biological or psychological ontologies and to reject conceptual relativity in the case of philosophical ontologies, the possibility of a normative ontological realism in the empirical sciences raises the question why we should stick with an absolutist conception of ontological realism in the case of philosophical ontologies. We would need a very good reason to believe that philosophers can achieve the goal of exactly one fundamental and objectively correct ontology while empirical scientists have to accept the existence of different but equally acceptable ontologies. The fear of Goodmania does not provide such an argument.

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