ON ONTOLOGY

by

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Chapter I. Introduction

1. The Question of Ontology

What is there? Do numbers, chairs, electrons, or witches exist? What are the necessary and sufficient *conditions* for existence? These are questions of ontology, questions about the constituents of the universe, and someone interested in ontology ought to try to provide an answer to them.

But while it may be tempting to try to settle such questions, I shall claim that answers in this area will not be forthcoming. I believe that it is hard to see how it could be settled by *us* what "any critical mark of the real itself"[1] might be. The present study will be devoted to exploring why. I will argue that we simply lack the philosophical tools to adjudicate between competing criteria, or sets of necessary and sufficient conditions, for what exists.

By way of preview, here's a little sampling of the kinds of criteria that I have in mind (I will provide a complete list of the criteria for what exists I discuss in this project in the next section): one might say that an entity exists if and only if it has causal powers.

Alternatively, one might think that an entity exists if and only if it is indispensable to science. Or, perhaps, an entity is real if and only if it is needed in the best explanation of phenomena (I am here using "real" and "exists" interchangeably). Though there is some overlap between these views, it's obvious that there's also a tension. For instance, numbers are generally not thought to have causal powers, but on some views at least, they are indispensable to science.

Given that there are several criteria for what exists that compete with one another, the following question arises: is there a way of deciding which one of these criteria is correct? Furthermore, if the existing proposals about what is real turned out to be inadequate, we might have to develop and argue for a new criterion. The question we thus face is: are we in a position to say which is the *right* criterion for what is real?

The main thesis in this project will be that we are not. I believe that questions about what exists are fundamentally irresolvable. In my view, the arguments philosophers have tried to use, as well as the arguments they could use, to help us adjudicate between criteria for what exists, fail. A criterion for what exists is

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[1] Campbell, 1994, p. 28.

philosophical bedrock, and it isn't possible for us to slide any justification underneath it.[2]

Before we can get to the defense of my main thesis, however, it is essential that we get a good grasp on at least some of the criteria available in the current literature. I therefore begin with a look at four candidates from the philosophy of science and mathematics and the arguments that support them. A sketch of the candidate criteria we will study is presented in the next section. In the third section of this introduction, I briefly discuss the putative entities that ontological disputes are over.

Let me now give a short overview of how I proceed in the rest of this project. I believe that in order to get an adequate statement of each of the candidate criteria for what exists that I want to discuss here, there are a number of preliminary issues that need to be sorted out. For instance, we need to better understand what we mean by a criterion for what exists. We also need to distinguish a criterion for what exists from another type of criterion in the literature of ontology: a criterion for the commitments of a theory. Moreover, we have to look at how the criteria

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[2] It is difficult not to slip into metaphor here. What I have in mind will become clearer in due course.

for what exists connect up with the discussion over realism and anti-realism in general. I also want to make some distinctions between my project and the views of Carnap and Quine. All of these issues are discussed in chapter II.

In chapters III - VI, we will look at a selection of candidate criteria for what exists. Getting a good statement of each criterion will not always be easy, since much of the time, the philosophers I discuss here provide only a sketch of their views about ontology. Therefore, it will be necessary that we expand on their position in certain respects. In doing so, I try to preserve, as best I can, the intuitions the criteria are based on. Also, the philosophers I discuss do not use the term "criterion for what exists". I impose this terminology on them because, as I see it, they do offer conditions on which entities are real.

Some of the criteria we will look at face internal problems that I see as insurmountable. These problems are not the result of the more general thesis I argue for, but they need to be brought to light because they have the following consequence: not all the criteria we will look at can be counted as good candidates to adjudicate between in the first place.

In chapter VII, I explore the possibility of using science to help us determine which criterion for what exists is correct. As we will see in the next few chapters, all the philosophers under discussion rely at least somewhat on either scientific theory or scientific practice in their argumentation. But not all of these philosophers arrive at the same conclusions. In chapter VII, I will try to show that scientific theories alone cannot be of any help in telling us what there is. This is because to arrive at a consensus of what ontological commitments are indicated by scientific theory, we first need to settle certain philosophical questions - questions that cannot be answered by resorting to science alone.

This shifts the question of ontology back into philosophical quarters. In keeping with this, chapter VIII discusses and evaluates the merits of various types of arguments for criteria for what exists that don't rely on any particular interpretation of scientific practice.

2. The Criteria

A survey of the contemporary literature in the philosophy of science and mathematics leads to several interesting criteria for what exists. I limit this study to four of them. We begin with the causal criterion. The causal

criterion for what exists says that all and only entities with causal powers are real.[3]

Two notable advocates of this position are Armstrong (1978) and Hacking (1983). Armstrong asks whether entities are "capable of *acting upon particulars.*"[4] He takes it that concrete entities, as well as properties and relations, are so capable, whereas numbers, sets, and other abstract objects are not. Hacking concentrates only on theoretical entities (he defines these as unobservables; examples are particles, fields, processes and the like). In his view, "[w]e shall count as real what we can use to intervene in the world to affect something else, or what the world can use to affect us."[5] In chapter III, I will present and evaluate the causal criterion for what exists.

In chapter IV, I take up a related criterion that I call "causal explanation". Here, the ontological inventory is provided by the *causal* explanations that are given for phenomena. All and only the entities to which causal

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[3] This criterion goes back to Plato's *Sophist*, p. 247e. There, the Eleatic Stranger says that the giants (materialists - 246a) will be prepared to admit that something is if it has any capacity at all, either to do something to something else or to suffer something from something else.

[4] Armstrong, 1978, p. 128.

[5] Hacking, 1983, p. 146.

explanations refer, enjoy the status of "real". Ellis (1990) and N. Cartwright (1983) base their ontologies on this view.

This criterion for what exists can also be extended to allow explanations that are not causal to be ontologically binding. A philosopher might argue that an entity is real if and only if it is referred to in the best explanation of a phenomenon, whether this explanation is causal or not. Though the roots of this idea can be found in Peirce,[6] a more current exponent of it is Harman (1965, 1977, and 1986). His line of reasoning has gained quite a foothold in the philosophy of science as well as in ethics.

Here's a quick example from Harman that illustrates how this criterion operates. A scientist sees a vapor trail in a cloud chamber and infers that there is a proton. The proton provides the best explanation for the vapor trail, and therefore, the scientist concludes, protons exist.[7] Harman also thinks that mathematical entities are real, because they figure in the explanation of scientific

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[6] Peirce, 1908.

[7] Harman, 1977, pp. 123, 124.

observations.[8] Moral facts, on the other hand, do not exist for Harman, because they're not needed in the best explanation of moral observations.[9] Harman's view is widely known as "inference to the best explanation". We will investigate it in chapter V.

A criterion that surfaces frequently in the philosophy of mathematics (though it can be applied across the board) can be developed from the Quine-Putnam indispensability thesis: whatever entities are indispensable to science are real. As the name indicates, both Quine and Putnam (1972) accept this thesis, but so do Field (1980, 1989) and Resnik (1995, 1997).[10] Here is Field's formulation of it:

> An indispensability argument is an argument that we should believe in a certain claim (for instance, a claim asserting the existence of a certain entity) because doing so is indispensable for certain purposes (which the argument then details).[11]

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[8] Ibid. A variant of Harman's idea is used by Wright (1992). It is supposed to escape criticism of Wiggins (1987) and is called "wide cosmological role."

[9] Harman, 1977, p. 123 and 124.

[10] A further supporter of the indispensability thesis is Colyvan (2001).

[11] Field, 1989, p. 14.

So, for instance, if a claim that asserts the existence of mathematical entities is indispensable for scientific purposes, then we are committed to the existence of mathematical entities. Indispensability is the topic of chapter VI.[12]

3. The Entities

A word is now in order about the types of putative entities ontology is concerned with. A distinction accepted by almost all philosophers is that between abstract and concrete entities. But what this distinction comes to is somewhat contentious. Traditionally, concrete entities are thought of as material, as located in space and time, and as having causal powers. But this list could also be read as a disjunction: to be classified as concrete, an entity must possess at least one of these characteristics.

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[12] The indispensability thesis is the impetus behind Field's nominalist program. For, if one accepts this thesis, *and* one also has nominalist inclinations (we'll see his reasons for this later), one needs to find a way to regiment scientific discourse without reference to mathematical entities. I hasten to add that the indispensability thesis does not by itself lead to nominalism. After all, neither Quine nor Putnam are nominalists (despite Quine's and Goodman's 1947). Other (non-nominalist) proponents of the indispensability thesis are Colyvan (2001) and Resnik (1995, 1997).

Abstract entities, on the other hand, are what concrete entities are not. This comes to the negation of the characteristics above: they are not material, not spatial, not temporal, and they don't possess causal powers. (These characteristics should be read as a conjunction.)

But even this most general distinction is not universally endorsed. To give one example, some philosophers hold that there are entities called 'tropes' (tropes are property instances), which are abstract particulars. Tropes are abstract entities *and* they are located in space and time. They are hence teetering on the fence between abstracta and concreta. Most prominently, Williams (1953) and Campbell (1981) have adopted this view.[13]

It seems that every distinction one can make in ontology has at least some opponents.[14] Though I'll be adopting the distinction between abstract and concrete entities that I provided above for the purposes of this project, one can also put the definition of this

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[13] For a helpful discussion on tropes, see Oliver (1996).

[14] For additional criticisms of the traditional abstract/concrete distinction and alternative proposals, see also Katz (1998, in particular, pp. 120-124) and Hale (1987, chapter 3).

distinction to one side, and instead look at the following list of examples provided by Burgess and Rosen (1997) to get an idea.[15]

Some abstract objects Burgess and Rosen list are numbers (i.e. natural, rational, and real numbers), sets or classes, properties, relations, unactualized possibles, meanings and intensions. One could add propositions, regularities and values to this list as well. Concrete objects are first and foremost physical objects: chairs and tables, but also black holes as well as protons and electrons. Burgess and Rosen further include physical events (because they occur in time) on their list; as well as mentalia, minds and spirits (if there are any), presumably because these have causal powers.

[15] Burgess and Rosen also provide a nice set of criteria for the distinction between abstracta and concreta. See their

Chapter II. Preliminaries

1. Introduction

I now address a number of issues that will help us bring this project into better focus. I will start with some further introductory remarks about criteria for what exists (section 2). Then we will spend some time on a commonly shared assumption regarding existence itself: the assumption that existence is mind-independent (section 3).

Third, (section 4) we need to distinguish a criterion for what exists from another type of criterion in the literature of ontology, namely, a criterion for the commitments of a theory (i.e. the criterion proposed by Quine). Fourth, we must take account of two different forms of realism: realism about theories and realism about entities. We will also explore the relationship between these two types of realism and the two types of criteria above (section 5). Finally, some remarks about how the position I argue for in this project is different from Carnap's (1950) are in order. In section 6, I take up Carnap's distinction between internal and external questions and the conclusions he draws from this distinction. I will then show how our positions differ.

1997, pp. 13-16.

2. Criteria for What Exists

A criterion for what exists provides the necessary and sufficient conditions an entity must meet in order to be counted as real. Such a criterion tells us which property, or which set of properties, an entity must possess in order to count as real. Take, for instance, the causal criterion for what exists: if and only if an entity has causal powers, it is real.[16] Theoretical entities are generally taken to have causal powers, so they exist. On the other hand, it is almost universally agreed that mathematical entities do not have causal powers. So, according to the causal criterion, numbers do not exist. A criterion for what exists is, naturally, a metaphysical criterion.[17]

But why, one might ask, is a criterion for what exists best understood as providing us with both necessary *and* sufficient conditions for what is real? The answer is that

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[16] How this plays out exactly, that is, for instance, whether we should say that a chair has causal powers or that the particles the chair is composed of do, depends on where one thinks the causal work is being done.

[17] I should make this clear: a criterion for what exists is *not* an epistemological criterion, nor is this project concerned with how we *come to know* what sorts of entities exist. It is concerned with the arguments that are taken as evidence that one or other criterion for what exists is correct.

most of the criteria for what exists discussed here are not just inclusionary, but also exclusionary: the impetus behind them is to show not only that certain entities *do* exist, but also that certain entities *don't* exist.[18]

But this poses a problem for some of the criteria we will look at: take the criterion of best explanation for example. If it represents necessary *and* sufficient conditions for existence, we'd have to conclude that nothing exists in a possible world that does not have explanations[19] (for instance, because it is uninhabited and thus, there's nobody to provide any explanations in that world).

We thus need to limit the debate over what exists in a way that avoids the problem just raised, while at the same time allowing the criteria presented here to be both inclusionary and exclusionary. I propose the following solution: we limit criteria for what exists to providing necessary and sufficient conditions for *the actual world only*. This squares with the fact that all the authors I discuss rely in some way or other on current (and therefore

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[18]If a criterion for what exists provides both necessary and sufficient conditions, then only one family of extensionally equivalent criteria can be correct.
[19] I'm here taking the view that explanations are statements.

actual) scientific practice as a guide to what there is (there would not be any such practices in an uninhabited possible world).[20] Such reliance restricts the picture they create of what there is to the actual world *in any case, and* it further allows them to claim that their criterion is both inclusionary and exclusionary.[21]

There is also another way to handle the objection that in a world that does not have explanations, nothing exists. And that is simply to say that in an uninhabited world, all and only those entities exist that *would* be used in the best explanation for phenomena. This turns the original criterion into a counter-factual. In principle, I have no objection to taking this route. I would, however, like to avoid having to discuss counterfactuals, and for that reason, I will proceed by taking the criteria to be criteria for the actual world only.

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[20] Furthermore, none of the authors I discuss here are interested in the merely *possible* existence of entities anyway. They are interested in what actually exists, not in what possibly exists.

[21] When we look at the different criteria for what exists in more detail in the next chapters, we shall see that this issue is more complicated than I am making it seem in this section. The complications that arise and how they may be handled will be discussed in the relevant chapters, however, and not here.

Most of the discussion in this project will revolve around necessary and sufficient conditions for what exists. In the last chapter, however, I shall broaden the discussion a bit and say something about sufficient conditions for what exists as well. As I shall argue, most of the conclusions I arrive at will hold of either interpretation of the term "criterion for what exists."

3. Mind-Independence

One assumption made by many, if not most, philosophers participating in the contemporary realism / anti-realism debate is that a realist about X's is someone who believes that X's exist *mind-independently.* Some examples are Field (1989), when he talks about mathematical realism,[22] and Resnik (1997), when he talks about realism in general,[23] as well as Devitt (1991), and Hale (1987), among others.[24]

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[22] Field, 1989, p. 1.

[23] Resnik, 1997, p. 11.

[24] This means that the thesis of this project is not addressed to any philosophers that hold what we might call idealist positions of sorts, that is, philosophers such as Kant, for instance, whose view rules out access to mind-independent objects, or full-blown idealists, who don't believe in the existence of mind-independent entities altogether.
Another point. One might wonder if it isn't possible to think of mind-independence itself as a criterion for what exists. I think that is certainly a possibility.

However, it needs to be pointed out that the view that existing entities are mind-independent faces certain difficulties. For instance, most realists want to count both minds and artifacts as real. Therefore, one's definition of mind-independence needs to be such as to accommodate these possible counter-examples.

This is a complicated issue, however, and it would take us too far afield to rehearse different definitions of mind-independence here. Furthermore, I don't have a well worked out view on which of these definitions is the correct one, so I will set the question about the correct way to cash out "mind-independence" aside.[25]

4. Quine and Ontological Commitment

As I said above, there are actually *two* criteria one might deal with in the enterprise of ontology: criteria for what exists, and criteria for the commitments of a theory.[26]

Whereas a criterion for what exists provides necessary and sufficient conditions for what exists, a criterion for

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[25] Field, Hale and Resnik do not address any counter-examples in their works. But Devitt (1991, chapter 13) and Vinueza (2001) have more to say about the issue.

[26] This distinction first surfaces in Quine (1951a).

the commitments of a theory tells us how to read the ontological commitments off a regimented discourse. Quine proposes such a criterion in his famous 1951a.[27] We recall that for Quine, to learn the commitments of a statement, we look at what the existential quantifier in that statement ranges over.[28] Thus, the statement "some dogs are white" is committed to white dogs (but not to whiteness), and the statement "some species are cross-fertile" is committed to species (and hence to classes).[29] Quine's criterion applies only to extensional theories that are couched in the language of first order logic.[30]

So, once a discourse (or theory) is properly regimented, Quine's criterion provides a way of telling which parts of it carry ontological weight. It tells us what ontological commitments are implied by the discourse, or the theory. Quine's criterion is also very intuitive because it largely tracks the way we actually talk. For

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[27] The role of the quantifiers vis a vis existence is first discussed by Russell in his 1918.

[28] Quine, 1948, p. 13 ff.

[29] Concerns have been raised over sentences that quantify over properties, such as "humility is a virtue." Quine thinks he can handle such sentences, (see his 1960), but this dispute has not yet been settled (see Oliver, 1996).

[30] Not many writers seem bothered by this.

example, it captures the intuition that the sentence "there are houses" is committed to the existence of houses.

Lastly, Quine's criterion for the commitments of a theory applies to any first order theory, *regardless of its truth value*. It is simply a tool for determining what the ontological commitments of a theory, *any* theory, are. And that is a good thing because we often take a theory to be true and later discover otherwise. This change of mind doesn't affect the cogency of applying Quine's criterion to the theory in question; it only affects our view of the status of the ontology read off from that theory with the help of Quine's criterion.

In addition to Quine's, there are also other criteria for the commitments of a theory available. Some of these other criteria for the commitments of a theory constitute legitimate alternatives to Quine's, and therefore, the more conservative attitude toward the criteria for what a theory commits us to is one of neutrality. That, at any rate, is the attitude I'm going to take in this project.

To warm us up to the idea that there are other criteria for the commitments of a theory besides Quine's, we first recall that Quine (1951a) himself discusses, but ultimately rejects, an alternative to his: a theory could be committed to the referents of the nouns contained in

that theory. Given the problems Quine raises for this criterion, however, I will not explore it further. Secondly, Armstrong offers an alternative to Quine's criterion: he thinks that a theory is committed to the entities that are needed to make the statements of that theory true. This suggestion is also called "the truthmaker theory". A discussion of the truthmaker theory can be found in the next chapter, where Armstrong's view is presented in detail.

Thirdly, there's yet another criterion for the commitments of a theory, or rather, an entire family of such criteria, that is of interest to us: one could take a theory to be committed to all and only those entities that *fall under a particular predicate*. I'm going to call this idea the "predicate approach to ontological commitment" and will spend the rest of this section discussing it.

> This predicate approach to ontological commitment is explored by Azzouni in his 1998. There, he says that one can provide a special predicate … say,… 'causally efficacious' … and recognize the ontological commitments of a discourse to be solely those objects falling under the extension of *that* predicate, to

treat only *those* objects as existing.[31]

Other examples of such predicates are "is spatially located", or "is observable" (or even "is red", if one were so inclined).

Interestingly, according to Azzouni, acceptance of the predicate approach to ontological commitment does not foreclose on an objectual interpretation of the existential quantifier. But: one could not understand that quantifier as having ontological force. The ontological force would instead be carried by the designated predicate.[32]

While Azzouni says little more about this in his 1998, he recognizes in his 2004 that the claim that the existential quantifier can be interpreted objectually, and yet *not be taken to have ontological force*, is quite controversial.[33] It is controversial because the semantic conditions for the objectual existential quantifier are (roughly): "There is an X which is P", for instance, is true iff *there is an X which is P*. And how could *that* not be read as ontologically committing?

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[31] Azzouni, 1998, p. 3.

[32] Ibid.

[33] Azzouni, 2004, pp.11-18.

What Azzouni argues in response is that this line of reasoning *already* presupposes that the *meta-language quantifier is ontologically committing.* Without this assumption, the argument *won't even get off the ground.* That is, the existential quantifier does not have to be read as ontologically committing, even if it is interpreted objectually. The only way to *get* the objectual interpretation of the existential quantifier to be ontologically committing is to *read* that quantifier as ontologically committing (but that is precisely what is at issue!). The semantic conditions for the object language, taken by themselves, don't force anything.[34] (And, I might add that Quine, when talking about the objectual interpretation of the quantifier, doesn't make the claim that it must always be interpreted as having ontological force.)[35]

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[34] Azzouni, 2004, pp. 54,55.

[35] Azzouni is not the only lonely voice in the crowd when it comes to denying the ontological force of the quantifiers. Yablo (2000, p. 304) argues that sometimes, the quantifiers are used metaphorically, not literally; and worse, that these metaphors are often essential, that is, he doesn't think its possible to rewrite discourse in such a way that this metaphorical use of the quantifiers disappears. And, according to Yablo, "not even Quine thinks that figurative quantification is ontologically committal." (Ibid.) Yablo also believes that one cannot always tell whether the quantifiers are used metaphorically or literally.

One way of formalizing the predicate approach to ontological commitment is like this: a theory is *not* committed to *everything* that's in the domain of the objectual quantifier, but merely to a *subset* of that domain, namely the subset that *falls under a certain predicate*. Azzouni (2003) puts it this way:

> The … suggestion is that an implication: (Ex)**S**x, would not indicate ontological commitment to **S**s. Only an implication: (Ex)(**S**x & **E**x), where **E** is the "existence" predicate, would indicate such commitment.[36]

(I gave examples of such existence predicates above.) In other words, according to the predicate approach, there are **S**s only if the above statement, (Ex)(**S**x & **E**x) is implied by the theory.

Take, for instance, the predicate "is causally efficacious", or **C**, for short. On the predicate approach, a theory is then committed to all and only those **S**s to which **C**x applies. In other words, the theory is committed to all and only those entities to which that theory attributes causal efficacy.[37]

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[36] Azzouni, 2004, p. 52, footnote 6.

[37] Another possible predicate one could take to carry ontological commitment is the predicate "**U**x", where **U**x holds by virtue of logic (e.g. x is red or not red, x is concrete or not concrete). If **U**x is taken to indicate

This last remark actually points to a possible wrinkle in this proposal: many theories do not contain the predicate "is causally efficacious" and furthermore, that predicate might not even be definable given the resources of that theory alone. Peano Arithmetic is an example of such a theory. The question thus arises whether such theories have ontological commitments if such commitments are indicated by the predicate "is causally efficacious". This problem generalizes to other predicates as well (e.g. "is concrete", "is located in space and time", "is red", etc.).[38] My response to this is that such theories do not have any ontological commitments. Some theories, *taken by themselves* - that is, without the resources of the larger theory in which such theories are embedded - are not ontologically committed to anything. If the predicate "is causally efficacious" (or some other such predicate) is not contained in the theory, and is not definable given the resources of that theory alone, then the resources of that

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ontological commitment, then the commitments of a theory turn out to be equivalent to the commitments of a theory using Quine's criterion alone. Thus, Quine's criterion can be seen as a special case of the predicate approach to ontological commitment. (I am indebted to Arnold Koslow for pointing this out.) In what follows, I will not be concerned with this predicate, however.

[38] It does not generalize to the predicate **U**x, however, which might be seen as speaking in favor of that choice.

theory alone are simply not sufficient to determine what falls under that predicate.

On the predicate approach, whether or not a theory has any ontological commitments, thus has to be determined on a case by case basis. That is, it would depend on which predicate is taken to indicate ontological commitment, and whether or not that predicate is contained within the theory or definable from within it. In short, while the scope of Quine's criterion to ontological commitment is limited to first order extensional theories, the scope of the predicate approach to ontological commitment is limited to theories that contain the predicate taken to indicate such commitment, or theories that have the resources to define such a predicate.

Since this may strike the reader as a drawback, here is a way of motivating the predicate approach. I proceed by example. Say a philosopher has decided that the correct criterion for what exists is the causal criterion. In other words, he takes it that all and only those entities that have causal powers are real. Such a philosopher, when evaluating the ontological commitments of theories, might find himself drawn to the predicate approach. In particular, he might find that the predicate "is causally efficacious" yields just the sorts of ontological

commitments he was hoping for. This is because the predicate "is causally efficacious" commits a theory only to those entities that indeed have causal powers. Thus, a theory would not be committed to numbers, for instance (given the assumption that numbers don't have causal powers, of course). It would, on the other hand, be committed to tables and chairs.[39] I should acknowledge that working out exactly which objects fall under the predicate that is taken to carry ontological commitment is a research program, and it might have to be done one theory at a time. But while I certainly think it is worthwhile, I'll have nothing more to say about it in this project.

An awkward consequence of the predicate approach is that on this approach, it is possible to say that there are **S**s that don't exist. For, a theory may imply (Ex)**S**x, but not (Ex)(**S**x & **C**x), and in this circumstance, it follows that "there are **S**s", but it does not follow that "there are causally efficacious **S**s," and so, there are **S**s, but they don't exist. And again, this generalizes to other predicates as well.

I believe, however, that "there is" in ordinary English is not, in any case, always taken to have

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[39] I will be returning to this issue in chapter III as well as in chapter VII.

ontological force. Thus, the fact that a consequence of the predicate approach is that there are **S**s that don't exist is not so awkward after all.

Support for this claim can be supplied from various sources. Let's start with a more recent one. Varzi, in his 2002, provides a number of examples (some familiar, some new) that show that the grammatical form of many ordinary English existence statements that we can, according to Varzi, "truthfully make" are full of what he calls "ontological traps."[40] That is, the grammatical form of these existence statements implies ontological commitments to entities that we do not take to be real.[41] Here's a sampling from Varzi's paper:

(1) There is a hole in this piece of cheese[42]

(2) There is a difference in age between John and Tom[43]

(3) There is a strong chance that Professor Moriarty will come[44]

(4) There are many virtues which Tom lacks[45]

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[40] Varzi, 2002, p. 3.

[41] As Varzi makes clear in his paper, this point actually goes back to Russell (Varzi, 2002, p. 3).

[42] Varzi, p. 5.

[43] Varzi, p. 4.

[44] Varzi, p. 5.

Some other "there is" statements that could be added to this list are

(5) There are only three tangos available on my dance card

(6) There are some situations I would not want to be in

and

(7) There is a novel I'd like to write[46]

and surely, there are many more. Prima facie, these statements seem to be committed to holes, age differences, chances, virtues, tangos, situations, and unwritten novels (because, after all, that is what these statements are saying).

But although we may be perfectly willing to utter such statements in ordinary discourse, many of us (both philosophers *and* - more importantly - ordinary speakers of English) think that there aren't such things as holes, age differences, chances, virtues, tangos, situations, and unwritten novels.[47] In fact, we may go as far as to say that it would not even occur to many ordinary speakers of

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[45] Varzi, p. 6.

[46] I am indebted to Arnold Koslow for this example.

[47] Hale (1987) may be an exception, and presumably, there are others. The point remains that minds are rather divided on this, however.

English that such statements *should* be read as ontologically committing.

Varzi then argues that only the "logical form [of statements] is ontologically transparent", and not the grammatical form.[48] Thus, philosophers end up having to rewrite statements like the above with the goal of exposing (or imposing, as the case may be, and, as Varzi makes clear, this distinction is *not* trivial) a logical form that does *not* commit such statements to the above entities.

But for us, the important lesson is only this: if it is true that there are (no pun intended) ordinary English "there is" statements that we can, in Varzi's words *"truthfully make"* [emphasis mine], and yet not be committed to the reality of the entities these statements say exist, then it seems to follow that *there are* **S**s but **S**s don't exist. It seems to follow, for example, that "there are holes, but holes don't exist".

Support for the claim that "there is", in ordinary English, cannot always be understood as having ontological

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[48] Varzi, 2002, p. 3. I have reservations about the claim that the logical structure of a statement is ontologically transparent, but I do think he is right in saying that we are not committed to the existence of an entity based on the grammatical structure of a statement.

force, can also be supplied by resorting to more venerable sources, such as Quine (1953):

> The philosophical devotees of ordinary language are right in doubting the final adequacy of any criterion of any ontological presuppositions of ordinary language,… In a loose way we often can speak of the ontological presuppositions at the level of ordinary language, but this makes sense just in so far as we have in mind some likeliest, most obvious way of schematizing the discourse in question along quantificational lines. It is here that the 'there is' of ordinary English lends its services as a fallible guide - an all too fallible one if we pursue it purely as philologists, unmindful of the readiest routes of logical schematization.[49]

All that said, I am still going to grant that the predicate approach to ontological commitment is at times at odds with the way we commonly use language. Nonetheless, it represents a genuine alternative to Quine's criterion, and, depending on which criterion for what exists a philosopher argues for, he may even find a predicate approach to ontological commitment more appealing.

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[49] Quine, 1953, pp. 106/107.

I should again make it clear that I am *not* here endorsing the predicate approach as the correct criterion for ontological commitment. In the previous paragraphs, I merely explored its cogency as an alternative to Quine's criterion. As I said above, my own attitude toward any of the available criteria for the commitments of a theory is neutral. I am not claiming that any of the possibilities discussed here is in fact correct. *But*: my neutrality towards criteria for the commitments of a theory will turn out to be important, if not crucial, to some of my arguments in support of my main thesis - the thesis that one cannot adjudicate between different criteria for what exists. (Another reason for why my neutrality matters with regard to this project will be discussed in section 6.)

Before closing this section, I want to return once more to Quine. It needs to be pointed out that Quine himself never offered a criterion for what exists. Quine further noted that the criterion for the commitments of a theory he provides does not help us to "adjudicate among rival ontologies."[50] This is because it does not provide a way for us to decide which theories we should actually adopt. Rather, he saw his criterion as a way of "testing

[50] Quine, 1948, p. 15.

the conformity of a given remark or doctrine to a prior ontological standard."[51]

With regard to which theories we should adopt, Quine's thoughts were these:

> [W]e adopt … the simplest conceptual scheme into which the disordered fragments of raw experience can be fitted. Our ontology is determined once we have fixed upon the over-all conceptual scheme which is to accommodate science in the broadest sense…[52]

Thus, I see Quine as indirectly accepting the theories that are accepted by science. This point may be contentious, but in his affirmation of naturalism, Quine provides some textual evidence that at least points in that direction:

> Now how is all this robust realism [belief in external things as well as belief in theoretical entities] to be reconciled with the barren scene that I have just been depicting? The answer is naturalism: the recognition that it is within science itself, and not in some prior philosophy, that reality is to be identified and described.[53]

Furthermore,

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[51] Ibid.
[52] Quine, p. 17.
[53] Quine, 1981b, p. 21.

> Naturalism: [the] abandonment of the goal of a first philosophy. It sees natural science as an inquiry into reality, fallible and corrigible but not answerable to any supra-scientific tribunal, and not in need of any justification beyond observation and the hypothetico-deductive method.[54]

Finally,

> [a]nyone who will say, "Physics is all very well in its place" - and who will not? - is then already committed to a physicalism of at lest the non-reductive, nontranslational sort stated above. Hence my special deference to physical theory as a world version, and to the physical world as the world.[55]

Quine also describes what he takes to be the scientific practice regarding theory adoption. In brief, any theory ought to have the following five virtues: simplicity, familiarity of principle, scope, fecundity, and success under testing.[56] (Note, by the way, that these are virtues

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[54] Quine, 1981a, p. 72.

[55] Quine, 1978, p. 98 in his 1981.

[56] Quine, 1955.

of theories, not virtues of entities, which means that to Quine, theories are confirmed as wholes.[57])[58]

Unfortunately, the proposals we will evaluate here are indicative of the fact that different conclusions about what kind of conceptual scheme science permits are possible. *Every* philosopher I discuss here provides a conceptual scheme that he takes to accommodate the scientific picture. Quine's proposal therefore only goes so far in settling the question of how to adjudicate between rival ontologies. This issue is further complicated by the fact that alternatives to Quine's criterion for the commitments of a theory are possible (here, I obviously differ with Quine - I will address this again in section 6). From this it would follow that one and the same theory could be interpreted as being committed to different entities, depending on which criterion for the

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[57] On this point, see also Quine's 1951b, p. 41, as well as his 1960, chapter II. Given Quine's methodology, it would not be possible to determine whether an entity exists in isolation from a theory.

[58] One final point. Quine speaks about what theory we should adopt, not what theories are true. But this should not be mistaken for the claim that theories cannot be true or false independently of what we believe. In his 1981 (p. 36), Quine says that "bivalence is a basic trait of our classical theories of nature. It has us positing a true-false dichotomy across all the statements that we can express in our theoretical vocabulary, independently of our knowing how to decide them."

commitments of a theory is applied to it (we will see this idea at work in the next few chapters).[59]

5. Two Forms of Realism

One can distinguish between two different types of realism: realism about theories and realism about entities. This distinction can be found in Hacking (1983) and Devitt (1991) for instance. I will here stick with Hacking's way of drawing it. A realist about theories believes that scientific theories are true or false independently of our beliefs. Furthermore, he thinks that the true scientific theories describe the world the way it really is. A realist about entities, on the other hand, believes that "a good many theoretical entities really do exist".[60] This view seems, prima facie, neutral with regard to the truth of theories.

This distinction opens up four different positions in logical space: someone could adopt theory *and* entity realism, *neither* theory nor entity realism, theory realism

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[59] The above quote raises another question worth pointing out, namely, how we can *tell* which conceptual scheme is the simplest. That is a question, however, that this project will not be concerned with.

[60] Hacking, 1983, p. 27.

but not entity realism, and entity realism *but not* theory realism.[61] Most realists adopt the first, and most anti-realists the second. As we'll see, however, other positions are defended as well. Hacking (1983), for instance, is an entity realist but not a theory realist (we will concern ourselves with the merits of his view in the next chapter).

Let us now connect this discussion to the distinction between criteria for what exists and criteria for the commitments of a theory. One might think that a criterion for what exists, since it provides conditions for the existence of certain *entities*, is a claim about entity realism *only*. Take, again, the causal criterion for what exists. It seems obvious that an entity has causal powers whether or not it is referred to in some theory or other. Therefore, if one adopts the causal criterion for what exists, it seems that one is not committed to the truth or falsity of any particular theory.

As it turns out, however, not all of the criteria for what exists under scrutiny here operate in the way the

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[61]It may strike the reader as odd that one could be a theory realist without being an entity realist, but it is a logical possibility: one could have the theory that all F's are G's although there aren't any F's, and thus, one's theory is vacuously true.

causal criterion does. This is most easily illustrated by using the indispensability thesis (from which, as we'll see in VII, the criterion of indispensability can be developed). The indispensability thesis, as Field formulates it, states: "we should believe in a certain claim … because doing so is indispensable for particular purposes."[62] Claims, of course, are statements. And if one believes in a claim, one thinks of that claim as true. In other words, to adopt the indispensability thesis is, first of all, to adopt realism about *statements* that are indispensable to science. Thus, according to the above formulation of the indispensability thesis, someone who accepts that thesis is, first and foremost, a theory realist, not an entity realist.

Now, of course a defender of the indispensability thesis doesn't just take himself to be concerned with the truth of certain claims. He also wants to say that the entities these claims are about exist. But in order to make that claim, he needs to adopt a criterion for the commitments of a theory.[63]

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[62] This was the formulation I gave in chapter I (Field, 1989, p. 14).

[63] This point is also made by Azzouni (1998, section 3).

6. Carnap and Ontology

In his 1950, Carnap argued for a view that bears some similarity to mine. He began with the distinction between internal and external questions. Internal questions are questions about the existence of entities from within a linguistic framework, and external questions are questions about "the existence or reality *of the system of entities as a whole.*"[64] Carnap then claimed that that when questions about existence are construed as external questions, they are devoid of "cognitive content".[65] Construed as *internal* questions, they *do* have cognitive content, however. Internal *empirical* questions (e.g. "are there dogs?") are answered by an empirical investigation, and internal *logical* questions (e.g. "are there numbers?") are analytic. For example, numbers exist because we've introduced the term "number" as well as variables of the type "number" into our framework. In other words, Carnap adopts Quine's criterion for the commitments of a theory, which then simply tells us that there are numbers.[66]

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[64] Carnap, 1950, p. 242.

[65] Carnap, p. 245.

[66] Carnap is quite explicit about his acceptance of Quine's criterion (1950, p. 249, footnote 4). But he may be

Several comments on this are in order: First of all, I would not construe existence questions of the sort I discuss here as external in Carnap's sense. I believe they are internal to the conceptual framework of science, and they thus do have cognitive content.

Secondly, we should note that Carnap seems to have a much more fragmented picture of frameworks than Quine does. Quine takes all of current science to be one framework. The quotes from II.4 might indicate this, but taking all of science as one framework is also more consistent with Quine's holism. Carnap, by contrast, is not a holist. I side with Quine on this matter.[67]

Thirdly, I am also Quinean in a related regard. I do not accept the distinction between the analytic and the synthetic.[68] I think, like Quine, that holism does not permit one to draw such a distinction. As Quine has noted, this affects Carnap's view because it disallows his

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willing to apply it to frameworks beyond those Quine approves of.

[67] The holism I favor is the weaker version Quine defends in the foreword to his 1980 (p. viii): "All we really need in the way of holism, …, is to appreciate that empirical content is shared by the statements of science in clusters and cannot for the most part be sorted out among them. Practically the relevant cluster is indeed never the whole of science; there is a grading off…."

[68] Quine, 1951a and 1954 (among others).

distinction between logical and empirical questions.[69] The question "are there numbers?" might hence in part be answered by empirical investigation.

But I don't think any of this is fatal to Carnap's original intuition, for it fails to undercut the distinction between internal and external questions (the distinction between analytic and synthetic only concerns internal statements). Therefore, the main thrust behind Carnap's position about ontology is preserved: external questions don't have any cognitive content, and internal questions have a fairly straightforward answer: whatever is quantified over in true statements exists. Thus, if the question I take up in this project is an internal one, the answer to it, for *both Quine and Carnap*, should be relatively straightforward.

But this is where I see the main difference between both Carnap and Quine on the one hand, and my position on the other. I believe that the answer to the question "what is there?" is straightforward only if we accept Quine's criterion for the commitments of a theory as the correct one. But I have shown (II.4) that Quine's criterion has legitimate alternatives, and that the more conservative attitude toward which of these is correct should be a

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[69] See Quine's 1951c, for instance, but also his 1966.

neutral one (I will try to further sustain this in VII). And if one takes a neutral attitude toward which criterion for the commitments of a theory is correct, the question "are there numbers?" (for instance) cannot simply be answered by looking at whether a theory quantifies over numbers. I would propose that instead, we must evaluate the competing proposals for criteria for what exists. And, to repeat, my thesis is then that there aren't any arguments that can show that one such set of conditions, or one such criterion, is indeed correct.[70]

[70] Disclaimer: I recognize that those who do not grant the neutrality toward criteria for what a theory commits us to, and who accept Quine's criterion as the correct one, can therefore not endorse this project. Or rather, if they do, they'd have to give reasons other than the ones I offer.

Chapter III. The Causal Criterion[71]

1. Introduction

We now start looking at the different criteria for what exists. The first criterion I want to examine is the causal criterion, which can be attributed to Armstrong and Hacking. A general statement of this criterion runs like this: *An entity exists if and only if it has causal powers.*

In my view, the causal criterion does present necessary and sufficient conditions for existence. As a merely sufficient condition, the criterion would run thus: if x has causal powers, it is real. But as a merely sufficient condition, the causal criterion does not justify the exclusion of objects that do *not* have causal powers (abstract objects, for instance) from one's ontology. If a philosopher wants to exclude *those*, he must also argue that an object is real *only* if it has causal powers. And, as we'll see, that is certainly what Armstrong wants to do. With Hacking, the situation is less straightforward since he seems mainly concerned with presenting evidence *for* the existence of some theoretical entities. But there is

[71] In his 1998, Cheyne also defends a causal criterion. I will not discuss it here, however.

textual evidence to suggest that for him, an entity that does not have causal powers is a hypothetical entity only.

In the next two sections, we will explore Armstrong's and Hacking's views on ontology and the motivations behind them. I will include a discussion of criteria for the commitments of a theory with these sections. Armstrong explicitly proposes not to use Quine's criterion for the commitments of a theory and offers his theory of truthmakers instead.[72] Hacking does not discuss any criteria for the commitments of a theory. This may be because he takes a neutral attitude toward which particular theories are correct. This forces us to explore some candidates without recourse to Hacking's views on this particular matter.

In the final section of this chapter, I will make a few critical observations about the causal criterion and how it is justified. My main criticisms of the arguments for criteria for what exists will be deferred to the last chapter, however.

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[72] I discuss this criterion for the commitments of a theory in this chapter, and not the previous one, because we have not yet explored in more detail the criterion for what exists that can be attributed to Armstrong. There is a certain tension between Armstrong's truthmaker theory and the causal criterion for what exists that will be easier to see if the discussion of truthmakers takes place here (section 2).

2. Armstrong[73]

In his 1978, Armstrong advocates a position he calls "minimal realism." This is the view that "the world contains nothing but particulars [which have] properties and [relations] to each other."[74]

Armstrong presents his reasons for taking only particulars, properties and relations to exist in the form of a dilemma. With regard to any entities we might posit beyond those mentioned above, he asks: "Are these entities capable of *acting upon particulars*, or are they not?"[75] For Armstrong, an object that acts upon a particular is an object capable of producing changes in that particular. It is an object that has causal powers. For him, if an object

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[73] Two points. First, Colyvan (1998, p. 320) understands Armstrong as proposing the criterion of causal explanation. I think this attribution is mistaken. In the quote Colyvan uses to support his view, Armstrong only invokes explanation to dismiss it as an option (this is in Armstrong's 1989, pp. 7,8). In my view, Colyvan thus misunderstood Armstrong's intentions in that passage. Second, one can find some interesting criticisms of Armstrong's causal criterion in Oddie's 1982 and Colyvan's 1998 and 2001.

[74] Armstrong, 1978, p. 126. Armstrong calls his position "minimal realism" to distinguish it from both nominalism (which holds that only particulars are real) and Platonic realism (which says that abstract entities exist also).

[75] Armstrong, p. 128.

does *not* have any causal powers, there is no reason for us to postulate that object:

> If any entities outside this [spacio-temporal] realm are postulated, but it is stipulated further that they have no matter of causal action upon the particulars of this realm, then there is no compelling reason to postulate them.[76]

Armstrong then argues that the only objects that in fact do have causal powers are particulars, properties and relations, and that therefore, only particulars, properties and relations exist.

Armstrong presents two arguments for the view that we have no reason to think anything but particulars, properties and relations have causal powers: one, he says that entities other than those required by minimal realism (such as transcendent universals, numbers and classes, transcendent standards of value, timeless propositions and possibilia - these are his examples)[77] are thought of as changeless, and how could entities that are themselves changeless produce change in particulars?[78]

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[76] Armstrong, p. 130.

[77] Armstrong, p. 128.

[78] Ibid.

Two, even if we could tell a story that explains why it is *logically possible* for a changeless entity to have effects on particulars, there's no reason for thinking that this is also a *physical* possibility.[79] This is because "we have fairly good scientific reasons for believing that Nature, the spacio-temporal system, is also a causally self-enclosed system."[80] In other words, nothing can be a cause that is not physical. And if only physical entities can be causes, then only physical entities exist.

Armstrong supports his view by dismissing two possible counterexamples to the claim that nature is causally self-enclosed. The first is God (who might be thought to intervene in nature while not being part of it himself), and the second is the dualist theory of mind.[81] Against the first, Armstrong says that people no longer believe in God, or at any rate in this view of God. Against the second, he points out that we have no neurological evidence that suggests that there exists a non-material mind that acts upon the brain.[82] And if both God and dualism fare badly,

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[79] Armstrong, p. 129.

[80] Armstrong, p. 128.

[81] Armstrong, p. 129.

[82] Ibid.

there is even stronger reason to believe that abstract entities do not exist.

I think these counterexamples are dealt with a bit too swiftly. First of all, there are many people who still believe in a God who has causal powers, so it would be better for Armstrong to simply argue that God doesn't exist. And secondly, some philosophers will point out that while there may be no *scientific* evidence for dualism, there are nonetheless good philosophical arguments for it. These arguments should be addressed if one opposes dualism.

But perhaps it is better to look beyond these counterexamples to what I think is the real motivation behind Armstrong's view. For what Armstrong is really relying on in presenting these arguments is scientific evidence: he says that there are "*scientific* reasons" for the causal closure of nature, so even if the counter-examples he presents are insufficient to provide these reasons, perhaps a more detailed study of those scientific reasons reveals his claim as true. While Armstrong does not undertake this study, Hacking will offer some reasons for how he sees current science to show that objects with causal powers exist (Hacking, however, does not argue that

nature is causally self-enclosed). We will therefore revisit this issue in the next section.[83]

One last, and rather important, point: while Armstrong does argue that only particulars, properties and relations have causal powers - his arguments for causal closure are designed to show this - he does *not* present arguments for the view that only entities with causal powers exist. Armstrong regards his minimal realism as a "world hypothesis", that is, "a hypothesis of "first philosophy"",

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[83] One other point: for Armstrong, properties and relations, as opposed to abstract objects, do have causal powers (despite the fact that they are universals). For instance, the redness of the dress may cause Elma not to buy it (red is not in style this season, and one would never buy anything that's not in style), and the fact that Tom bears the 'taller than' relation to John may cause Sally (who has the wrong priorities) to go out with Tom, rather than John. These examples are not Armstrong's. But since he defends a version of realism that includes properties and relations, we have to consider what some examples might be. The above are the best ones I can come up with. I understand that normally we would not talk this way. We would instead say that it is the fact that Tom is taller than John is what makes Sally go out with Tom. But I think Armstrong intends that properties and relations function in the way I've suggested.
I should also point out that in his 1997, Armstrong moves toward a discussion of states of affairs that are constituted by the entities, their properties and relations. It seems then that states of affairs must be regarded as the items that have causal powers, rather than their constituents. He does not do so in his proposal of the causal criterion, however, so I am going to stick to his way of presenting his criterion for what exists for this part of the discussion. We can only speculate how this picture would change if states of affairs were considered the bearers of causal powers.

and he states that "one could hardly put forward a more general hypothesis than this."[84] Perhaps this is the reason why he limits himself to presenting arguments for which entities do, and which entities do not, have causal powers. In any case, why only entities with causal powers should be considered real in the first place, is not something he discusses.

For us, this is unfortunate, because it is precisely that kind of "first philosophy" that we are interested in. We want to know what could make Armstrong's "one world-hypothesis" true, but Armstrong himself does not help us here.

We now turn to the discussion of what sort of criterion for the commitments of a theory Armstrong might be seen as endorsing. Here, Armstrong proposes his theory of truthmakers.[85] I should point out that while Armstrong doesn't *explicitly* say that the truthmaker theory should be

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[84] Armstrong, p. 128.

[85] In what follows, I largely refer to Armstrong's as yet unpublished work on the theory of truthmaking. Since the specific phrasing of some passages are still subject to change, at his request, I will paraphrase this work only. One other point: Armstrong only discusses the truthmakers of propositions, and not the falsemakers. He believes that the latter are not needed. Arguments for this can be found in his 2000, section 2, entitled "Negative and General Truths".

understood as a *criterion for the commitments of a theory*, he does reject Quine's criterion and seems to offer his truthmaker theory in its stead.

A truthmaker is some entity, or some state of affairs, that makes a particular proposition true.[86] The constituents of states of affairs, in turn, are individuals (i.e. entities), properties and relations.[87] For instance, the proposition referred to in "grass is green" is made true by the state of affairs that grass is green.

Armstrong holds that to postulate truthmakers for certain propositions is to admit them into one's ontology. Thus, what a theory is committed to, is not what it quantifies over, but the states of affairs that make the propositions of that theory true. Armstrong's reason for going non-Quinean here is that the properties referred to by predicates can now also be admitted into one's

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[86] A proposition is an intentional object for Armstrong, not an abstract object. More should be said here about this, but it will take us too far afield (in addition, Armstrong's own discussion of this is not yet completely worked out). Another point: sometimes Armstrong talks as though truthmakers are entities, other times he talks as though they are states of affairs. I am not sure which of the two ways of constructing the view he actually favors.

[87] Armstrong, 1989, p. 41. Armstrong does not think that the constituents of states of affairs can be parts, however. In his view, a state of affairs cannot be deconstructed.

ontology.[88] This squares with his view that properties are real.

On the face of it, the truthmaker theory seems at odds with the causal criterion, for are there not propositions that are made true by objects that don't have causal powers, such as the propositions of mathematics? Suppose the proposition expressed by "John has 4 cats" is true. As truthmakers, it appears as though we need John, cats, but also the number 4. But numbers do not have causal powers, so it seems that the number 4 is not to be had as a truthmaker.

Unfortunately, Armstrong does not directly deal with this issue in print. No discussion is available about how the truthmaker theory relates to his view that only entities with causal powers are real. Moreover, I think that to sort out exactly *how* one might try to connect the two views would require extensive discussion of the truthmaker theory. This is not my purpose here. I will therefore limit my treatment of this to a few pointers.[89]

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[88] Armstrong (2002). He explicitly contrasts his view with Quine's in the relevant passage.

[89] Some difficult cases for the theory of truthmaking are dealt with in Armstrong's 2000 (these are negative truths, general truths and modal truths).

Armstrong thinks that small numbers such as 4 are instantiated by individuals. "4", for instance, is instantiated by John's 4 cats. And since "4" is thus a property of John's four cats, it does have causal powers. More has to be said here, however. There are, for instance, propositions that are just about numbers, such as the proposition expressed by "5+7=12". The numbers that proposition purports to refer to, do not function as properties of objects in that proposition. Similarly, we need to account for uninstantiated numbers, irrational numbers, and real numbers. One might also raise concerns about sets.

Armstrong discusses numbers and sets in his 1989. Briefly, Armstrong thinks that "mathematical 'existence', is the possibility of actual existence" and that "according to this view, numbers are in the first place internal relations between possible universals".[90] In his 2000, Armstrong then explains that mathematical truths should be understood only as hypothetical truths.[91] With regard to the truthmaker for the proposition expressed by "5+7=12", he says:

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[90] Armstrong, 1989, pp. 126, 127.

[91] Armstrong, 2000, p. 6.

> If there are seven things and a further five things these things number twelve things. So it does not depend on the existence of twelve things. All that is needed is that the existence of 12 things is possible.[92]

There is one further observation I want to make about the truthmaker theory. If the truthmaker theory can be made to work, it might provide a genuine alternative to Quine's criterion. This is interesting, for I'm not sure that it has been regarded as such in the literature. Still, it seems to me that the truthmaker theory can, and perhaps should be thought of, as a criterion for the commitments of a theory. For, according to it, a theory is committed to all and only the objects, or states of affairs, that make the statements of that theory true.

3. Hacking

"*Scientific realism* says that the entities, states and processes described by correct theories really do exist."[93] In his 1983, Hacking defends a version of scientific realism that concentrates on the entities science deals

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[92] Ibid.

[93] Hacking, 1983, p. 21.

with. Hacking focuses only on theoretical entities, though his realism can be extended to other objects (he mentions superegos and capitalism).[94]

With regard to the truth of theories, Hacking describes himself as agnostic. To explain his views, he uses the example of electrons:

> There are a lot of theories, models, approximations, pictures, formalisms, methods and so forth involving electrons, but there is no reason to suppose that the intersection of these is a theory at all.[95]

In his view, then, science does not present us with a unified theory of electrons. Hacking also points out that this point has been argued by N. Cartwright in her 1983. (We will look at this in the next chapter.)

Hacking then focuses on his realism about entities. In his view, "we shall count as real what we can use to intervene in the world to affect something else, or what the world can use to affect us".[96] For example,

> by now there are standard emitters with which we can spray positrons and electrons - and that is precisely

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[94] Hacking, p. 38.

[95] Hacking, p. 264.

[96] Hacking, 1983, p. 146. I quoted this passage in chapter I.

what we do with them. We understand the effects, we understand the causes, and we use these to find out something else.[97]

Hacking's key idea, and one that he keeps reiterating throughout his work, is "intervention". We use electrons to intervene in certain scientific processes, and that is our justification for taking them as real.

Hacking's realism about entities, as he describes it, has two ingredients. The first ingredient is a metaphysical one: causation.[98] The second ingredient is epistemological: "we can have warranted belief in …[some of those] entities (at least in principle)."[99]

Hacking's reasons for believing that the entities we can use to intervene in nature are real thus derive from scientific practice. Specifically, they derive from the experimental work we do with these entities. We make use of their causal powers: "entities that in principle cannot be 'observed' are regularly manipulated to produce new

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[97] Hacking, p. 24.

[98] Hacking, p. 28.

[99] Ibid.

phenomena and to investigate other aspects of nature."[100] Electrons are a good example of this because

> we regularly set out to build … new kinds of device[s] that use various well-understood causal properties of electrons to interfere in other more hypothetical parts of nature.[101]

What are Hacking's views with regard to entities that do not have causal powers? I must confess that I have not found any bulletproof evidence to show that Hacking believes that an entity that does not have causal powers is not real. I would speculate that this is his view, however, and for the following reason. In a section entitled "When hypothetical entities *become real*" [emphasis mine],[102] he makes the following contrast between electrons and bosons:

> [n]obody can yet manipulate a bunch of neutral bosons, if there are any. Even weak neutral currents are only just emerging from the mists of hypothesis. By 1980 a sufficient range of convincing experiments had made

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[100] Hacking, p. 262.

[101] Hacking, p. 265.

[102] Hacking, p. 272.

> them the object of investigation. When might they lose their hypothetical status and become commonplace reality like electrons? When we use them to investigate something else.[103]

This quote at least suggests that if an entity cannot yet be used to intervene in nature, it only has hypothetical status. But I would think that it also suggests that if it were in principle *impossible* for an entity to ever be used to intervene in nature, then such an entity will retain hypothetical status for good. While Hacking does not talk about this, if his view *were* that numbers, for instance, could never even in principle be used to "investigate something else", then I think he would also have to say that they would never change their status from hypothetical to real. I would therefore conclude that Hacking, too, is offering a necessary and sufficient condition for what exists, though I'm not sure that the evidence I have for this is conclusive.

We now turn to the issue of the different ways in which criteria for the commitments of a theory can be made to be compatible with Hacking's proposal. Apart from the fact that Hacking provides no guidelines here, this issue

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[103] Ibid.

is further complicated by his own agnosticism regarding theories.

Let me explain why this is so. If someone holds that a particular theory is true, then (it seems to me) he will also believe that the objects that theory is ontologically committed to (if any) are real. Secondly, if that same person believes that all and only the objects that exist are the objects that have causal powers, that is, if that person also accepts the causal criterion for what exists, then he will want to be sure that the theories he holds true are only committed to objects with causal powers.

Now, Hacking is *not* a realist about scientific theories. As I said earlier, in his view, science does not present us with unified theories, and Hacking does not think that there's a reason to take the intersection between all the theories about - say, electrons - as "a theory at all". But if he isn't a theory realist, then it would seem that the issue of how to make the causal criterion for what exists compatible with criteria for the commitments of a theory does not even arise for him.

However, the issue *does* arise for a proponent of the causal criterion for what exists who is also a theory realist. That is, the issue arises for a proponent of the

causal criterion for what exists who believes that at least some of our current scientific theories *are* true.

Now, a proponent of the causal criterion for what exists will certainly want to deny that abstract objects, such as numbers, are real because abstract objects are taken not to have causal powers (I.3). What should he do about theories that quantify over such objects? I will explore two possibilities.

Possibility one: let's say he adopts Quine's criterion for the commitments of a theory. In that case, he has two ways of dealing with discourse that quantifies over abstract objects. One, he can argue that discourse that quantifies over abstract objects is false. This would still allow him to be a realist about some theories, but only in a more restricted sense: he cannot be realist about those theories that quantify over abstract objects. Two, he can try to show that talk about abstract objects can be paraphrased into talk about objects that have causal powers. This, again, would allow him to be realist about some theories, but his realism would still have to be limited to theories in which talk about abstract objects is paraphrased into talk about objects that have causal powers.

Possibility two: let's say he adopts a specific version of the predicate approach to ontological commitment (one that is not identical to Quine's criterion).[104] In particular, let's say he takes a theory to be committed to all and only those entities that are quantified over *and* that fall under the predicate "is causally efficacious". This would permit the proponent of the causal criterion for what exists to take discourse that quantifies over all abstract objects to be true. Since abstract objects are not taken to have causal powers, the predicate "is causally efficacious" does not apply to them, and therefore, they are not among the ontological commitments of theories, even if such theories quantify over these objects. Furthermore, it would not be required that he paraphrase away discourse that quantifies over abstract objects.

As I said in the previous chapter, employing the predicate "is causally efficacious" to read the ontological

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[104] Reminder. In chapter two, I said that one possible predicate one could use to read the ontological commitments off from theories was the predicate "**U**x", where **U**x holds by virtue of logic (e.g. x is red or not red, x is concrete or not concrete). As I explained in that chapter, if **U**x is taken to indicate ontological commitment, then the commitments of a theory turn out to be equivalent to the commitments of a theory using Quine's criterion alone. Thus, Quine's criterion can be seen as a special case of the predicate approach to ontological commitment. As we will see, however, this is not the predicate I have in mind here.

commitments off a discourse *would* leave dangling the worry that what the ontological commitments of a discourse appear to be and what they really are differ, because the phrase "there is" wouldn't be doing the ontological work we'd take it to do. But, here, I think we'd just have to bite the bullet.[105]

4. Conclusion

I now want to return to the issue of how to motivate the causal criterion for what exists. The first observation worth making is that only Hacking actually tries to offer some justification for the correctness of the causal criterion for what exists in the first place. Armstrong does not tackle that issue but only offers reasons for why only particulars, properties and relations have causal powers. But that is not the same as to offer justification for why only entities with causal powers *exist*.

Hacking, as we saw, takes scientific practice to suggest that entities with causal powers are real. He shows this by detailing what scientists actually do that convinced him (and should convince us) that causally

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[105] Perhaps this wouldn't be a dreadful as it sounds, for, as I tried to show in II.4, it is far from clear that "there is", in ordinary discourse, always plays an ontologically committing role.

efficacious entities are real: they use these entities to intervene in nature.

Being able to use an entity to intervene in nature certainly seems to be good reason to believe in its existence.[106] But this raises an important question: is it good enough reason for believing that *only* entities with causal powers are real? That is, does Hacking present us with good enough reason for taking the causal criterion for what exists to present both *necessary and sufficient* conditions for what exists?

Above, I was somewhat hesitant to attribute this position to Hacking. On the other hand, I think that the causal criterion for what exists would have little bite if it were interpreted as a sufficient condition only, because then, it would not license us to exclude certain entities from our ontology (such as numbers, for instance - we've seen, in particular, that this is something Armstrong is interested in). If the causal criterion for what exists only provided a sufficient condition for what exists, this *might* allow us to say that as yet, we don't have reason to

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[106] I am not saying that I endorse this reasoning. I remind the reader that in chapter VII, I will raise some difficulties for using current scientific practice to determine what is real.

believe in such entities,[107] but only a necessary condition for what exists would allow the *further metaphysical conclusion* that such entities are not real.

But if that's the conclusion we're after, then we need to provide reasons for excluding the existence of certain entities. Are there such reasons provided by Hacking? I would say "no". While we might grant that there is scientific evidence for taking entities with causal powers to be real, this only provides justification for taking the causal criterion as a sufficient condition for what exists. But what is the evidence that entities that lack causal powers do not exist?

In other words, I think that questions like "why are numbers not real?" can still be raised, despite the arguments marshaled by Armstrong and Hacking. We still need to know what can be considered evidence for the claim that entities without causal powers are not real. Such evidence is not provided by either Armstrong or Hacking.

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[107] I'm not even sure that we are entitled to say that much, because the question then arises of what we would offer as a reason for *why* we don't have reason to believe in such entities. And one reason that would not be available to us in this context is that we shouldn't believe in such entities because *they don't exist*. In order to give *that* as a reason, we need to have a necessary condition for what exists already in place.

Chapter IV. Causal Explanation

1. Proceeding from Scientific Practice

Our current scientific view of the world provides us with the best guide to what there is.[108] If our scientific view changes, we may come to accept a different ontology, but for now, what science provides us with is physicalism.[109]

This picture is endorsed explicitly by Ellis and implicitly by N. Cartwright. In the eyes of both of these philosophers, if an entity is referred to in a causal explanation, it is real. Furthermore, neither Cartwright nor Ellis believes that non-causal explanations carry ontological weight (non-causal explanations are explanations that do not cite causes - we will look at the contrast between these two types of explanation in more detail in the next two sections).

Both Cartwright and Ellis are realists about causal theories. That is, they believe that theories that describe causal processes, or causal phenomena, are candidates for being true. Furthermore, they are realists about the entities these theories refer to. However,

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[108] Ellis, 1990, p. 19.

[109] Ellis, p. 21.

neither Cartwright nor Ellis are realist about theories that do not describe causal processes, and they use this to ground their anti-realism about the entities these theories purport to refer to.

The criterion for what exists that can be developed from the views of Ellis and Cartwright reads like this: an entity exists if and only if it is referred to in a causal explanation. In what follows, I will call this criterion for what exists "causal explanation".[110]

Cartwright and Ellis' anti-realism about entities that are purportedly referred to in explanations that do not describe causal processes provides a rationale for taking the criterion of causal explanation as offering both necessary and sufficient conditions for what exists: it is clear that both philosophers seek to exclude entities that don't have causal powers from their ontology.

The necessary condition of this criterion for what exists creates an obvious problem, however. As I said in II.2, according to criteria such as this one, nothing would exist in a world that does not have explanations. To get

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[110] I think that what these two philosophers mean by "explanation" is actually just the explanans, and not the explanandum. This will become more obvious when we look at their views in more detail (sections 2 and 3). But since they both use the term "explanation" rather than "explanans", I will stick with their usage of the term.

around this problem, I limited the necessary and sufficient conditions to the actual world only. Since in this world, there are explanations, according to the criterion of causal explanation, there are also objects in this world.

However, in the actual world, causal explanations shift over time. For example, none of our causal explanations made reference to DNA 100 years ago. Now, some of them do. But according to our formulation of the criterion of causal explanation, that means that 100 years ago, DNA did not exist, which is clearly false.

I don't think that this consequence is intended by either Cartwright or Ellis, but if we understand their views in the way I shall argue for here, that is, if we understand them as suggesting that an entity exists if and only if it is referred to in a causal explanation, then some clarification on this point is needed.

As we can see from the discussion thus far, the world pictures Cartwright and Ellis arrive at are pretty similar. But there are also some important differences between their views, and furthermore, the reasons they provide for adopting this picture are not the same. This requires that we discuss these philosophers separately (sections 2 and 3). The main point I want to make in this chapter, however, is addressed in the last section: I argue that

what has come to be known as the facticity of explanation creates problems for this criterion. To say that explanations are factive is simply to say that if a statement is an explanation, then it is also true. So there aren't any false explanations. And as I shall try to show, Cartwright and Ellis claim precisely the opposite.

In this chapter, I will skip a discussion of criteria for the commitments of a theory. This is simply because I think that the criterion of causal explanation, since it relies on the assumption that not all explanatory statements are true, is not even a feasible candidate for a criterion for what exists. We can thus save ourselves the work of deciding which criterion for the commitments of a theory Cartwright and Ellis' views might be compatible with.

2. Cartwright

In her 1983, Cartwright motivates what I've called the criterion of causal explanation with her view of laws. She distinguishes between phenomenological and fundamental laws, a distinction that, in her view, corresponds to actual scientific practice. She states that phenomenological laws describe phenomena, whereas

fundamental laws seek to explain them.[111] Phenomenological laws may employ theoretical terms (such as "electron") in their descriptions, but only fundamental laws invoke the theories we have about the entities these terms denote.[112]

Cartwright then rejects the idea that fundamental laws state truths.[113] Her reasons for this inform her view on the existence of theoretical entities. Cartwright uses the law of gravitation ($F=Gmm'/r^2$) as an example of a fundamental law. As she sees it, this law, as well as many other fundamental laws, contains a *ceteris paribus* clause because it applies only if no other - non-gravitational - forces are at work, such as electric forces, for instance. But in nature, she argues, this just isn't the case: there are *always* other forces at work. Hence, the law of gravitation can only explain in ideal circumstances, but not in the circumstances that actually obtain in nature. Cartwright thinks that in order for us to use this law to explain *actual* phenomena, we have to remove the *ceteris paribus* clause, but then the law becomes, strictly

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[111] Cartwright, 1983, pp. 1-3.

[112] Ibid. Cartwright, incidentally, does note that this neat division between different types of laws is difficult to draw in actual practice (p. 77).

[113] Ibid.

speaking, false.[114] From this, Cartwright concludes that in the case of fundamental laws, "[t]here is a trade-off between truth and explanatory power."[115] If a fundamental law is to have explanatory power with regard to actual phenomena, the *ceteris paribus* clause must be dropped, which makes the law itself false. If the *ceteris paribus* clause is not dropped, then the law is true but it does not have explanatory power - it cannot explain any actual phenomena.[116] About explanations that use fundamental laws, Cartwright says:

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[114] Cartwright, pp. 56-59.

[115] Cartwright, p. 59.

[116] There is more going on in the few pages I just summarized than I indicated here. Let me therefore provide some more elaborate quotes. According to Cartwright, "[w]e think that nature is governed by a small number of simple, fundamental laws. The world is full of complex and varied phenomena, but these are not fundamental. They arise from the interplay of more simple processes obeying the basic laws of nature. … This picture of how nature operates to produce the subtle and complicated effects we see around us is reflected in the explanations we give: we explain complex phenomena by reducing them to their more simple components" (p. 58). Cartwright calls this type of explanation "explanation by composition of causes" (ibid). In her view, "[i]t is characteristic of explanations by composition of causes that the laws they employ fail to satisfy the requirement of facticity. The force of these explanations comes from the presumption that the explanatory laws 'act' in combination just as they would 'act' separately. It is critical then, that the law cited have the same form, in or out of combination. But this is impossible if the laws are to describe the actual behaviour of objects. The actual behaviour is the resultant of

> Explanations … organize, briefly and efficiently, the unwieldy, and perhaps unlearnable, mass of highly detailed knowledge that we have of the phenomena. But organizing power has nothing to do with truth.[117]

We can thus conclude that for Cartwright, fundamental laws can have explanatory power, that is, they can explain phenomena that actually occur in nature, but they can do so *only* when they are reformulated in a way that they are false. In her view, then, a fundamental law can have explanatory power even though it is false.[118]

For Cartwright, this does *not* apply to explanations that invoke phenomenological laws, however. These explanations cite causes, and the phenomenological laws they contain do not have to be adjusted or changed in order to explain phenomena. In addition, whether or not the right cause has been cited can be tested by experiment.[119] By contrast, fundamental laws cannot be directly tested

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simple laws in combination. The effect that occurs is not an effect dictated by any one of the laws separately" (pp. 58/59).

[117] Cartwright, p. 87.

[118] Additional evidence for the fact that Cartwright believes that a false statement can have explanatory power can be found in her discussion of Duhem and van Fraassen (essay five in her 1983). For more on this, see section 4 in this chapter.

[119] Cartwright, p. 82.

because the *ceteris paribus* clause has to be removed before they can be applied to phenomena.[120] Also, she thinks that when explanations are given in terms of fundamental laws, we usually find that several *competing* explanations are possible. But when it comes to causal explanation, we would only accept *one* explanation as correct.[121]

Cartwright illustrates her ideas about causal explanation with an example:

> My newly planted lemon tree is sick, the leaves yellowing and falling off. I finally explain this by saying that water has accumulated in the base of the planter: the water is the cause of the disease. I drill a hole in the base of the oak barrel where the lemon tree lives, and foul water flows out. That was the cause.[122]

First of all, this explanation does not contain a *ceteris paribus* clause. It is a straightforward phenomenological explanation that is aimed at providing the causes of the phenomenon. No fundamental laws are invoked. Secondly, the truth of this explanation is tested by experiment.

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[120] Cartwright, pp. 56-59.

[121] Cartwright, pp. 75-78.

[122] Cartwright, p. 91.

Cartwright drills a hole into the bottom of the barrel and discovers foul water. Foul water is a common cause of disease in plants, and it is clearly present here. Thirdly, there is only one explanation given for the phenomenon: the foul water. There are no other, competing, explanations. The water caused the plant to be sick, not something else.[123]

This example leads directly to the reasons why Cartwright thinks that the entities referred to in such causal explanations (e.g. the water above) must be real. Here's how she continues:

> Before I had drilled the hole, I could still give the explanation and to give that explanation was to present the supposed cause, the water. There must *be* such water for the explanation to be correct. An explanation of an effect by a cause has an existential component, not just an optional extra ingredient.[124]

For Cartwright, when we provide a causal explanation for a phenomenon, we infer from the existence of a particular effect (the sick plant) to the existence of a certain cause

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[123] To Cartwright, any explanatory statement that does not invoke water as the cause is simply false, and this can be proven by experiment.

[124] Ibid.

(the foul water). There really had to be foul water in the barrel for the plant to get sick.

In Cartwright's view, such is not the case with explanatory statements that invoke fundamental laws. These laws are, strictly speaking, false, and the entities purportedly referred to in such statements do not exist. Cartwright provides two examples of this: explanations that are couched in terms of the law of gravitation and explanations that are couched in terms of Coulomb's law. In her view, "[t]hese two laws are not true; worse, they are not even approximately true".[125] While

> they appear, on the face of it, to describe what bodies do … this cannot literally be so. For the force of size Gmm'/r^2 and the force of size qq'/r^2 are not real, occurrent forces. In interaction a single force occurs - the force we call the 'resultant' - and this force is neither the force due to gravity nor the electric force. On the vector addition story, the gravitational and the electric force are both produced, yet neither exists.[126]

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[125] Cartwright, p. 57.

[126] Cartwright, p. 60.

3. Ellis

In outlining his ontology, Ellis draws the distinction between two different kinds of theory. There is, on the one hand, theory that

> describes the processes which may be supposed to underlie physical phenomena. It refers to various physical entities interacting in various ways to produce manifest effects.[127]

In his view, theories of this type provide *causal process explanations* of certain phenomena. On the other hand, we have theory that refers to "ideal types [of entities] of one kind or another, and often properties attributed to them are ones which no ordinary physical system does, or even could, possess."[128] This type of theory provides *model-theoretic explanations*, and the laws invoked in it are called "framework principles". This latter type of theory describes "how certain *ideal* systems would behave in various specified circumstances."[129] Some examples of

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[127] Ellis, 1990, p. 21.

[128] Ibid.

[129] Ellis, p. 59. The examples he gives on that page are explanations that involve the laws of conservation or energy and momentum. He says that these laws "apply only to closed and isolated systems, although there are no macroscopic systems other than the universe s a whole which

model-theoretic laws are the laws of Euclidean geometry and set theory.[130]

According to Ellis, "ontological commitment can derive only from causal process explanations, not from *model-theoretic explanations*".[131] Let us now look at the arguments Ellis provides for this view. We start with the reasons he offers against the idea that framework principles carry ontological weight. His argument begins with the observation that framework principles only "make essential reference to abstract ideals of one kind or another - things which either do not, or could not, exist

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are like this (and whether these laws apply to the universe is at least problematic)." (Ibid.)

[130] Ellis, pp. 25-27. About Euclidean geometry, Ellis says: "We can use [Euclidean geometry] to explain why this angle is equal to that one, why this distance is twice as great as that one, or why this volume is greater than that. But the points, lines and planes of Euclidean geometry have properties which no physical systems could have. Subsequently, there is no question of there being such entities in nature." (P. 25) Sets, he says, "are in much the same boat. They are abstractly considered heaps or collections of things. However, they are not like ordinary heaps or collections. [They]… need not coexist in space or time… Consequently, sets cannot take parting the causal processes of nature, as any ordinary heap or collection of things might do." (P. 27)
One other point. We can see that Ellis presumes that statements can in fact be sorted into either one of these two categories.

[131] Ellis, p. 22.

in nature."[132] Ellis says, for instance, "the points, lines, and planes of Euclidean geometry have properties which no physical systems could have."[133]

Furthermore, he states that model-theoretic explanations "cannot be taken literally as true generalized descriptions of reality … for they would all be vacuous."[134] So it seems that explanatory statements involving framework principles should not be taken as true. For if they were true, they would not apply to anything.[135] We should note,

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[132] Ellis, p. 23.

[133] Ellis, p. 25.

[134] Ellis, p. 59.

[135] The claim that explanatory statements that involve framework principles should not be taken as true is perhaps more contentious than I am suggesting here. While it does seem to follow that if a statement is not to be taken as literally true, it should be taken as false (the only other options being that either we suspend judgment about these statements, or that there are neither true nor false), in the introduction to his book (p. 5), Ellis says this about model-theoretic explanations: "while … entities [that cannot influence any causal processes] may have a role in model theoretic explanations, acceptance of such explanations carries no ontological commitments." The term "acceptance" could suggest that such explanations are to be taken as true after all. On the other hand, one could accept an explanation, but think of it as playing a purely instrumental role, which, as I see it, does not require that that explanation has to be taken as true. This issue is further complicated by the fact that Ellis, in part III of his book, proposes a pragmatic theory of truth. In his view, truth "is what it is right to believe" (p. 2 - introduction). If one held such a view of truth, perhaps the fact that a statement that is taken to be true does not

however, that Ellis is clearly convinced that statements that involve framework principles do have an explanatory role, despite the fact that they should not be taken as literally true. Otherwise, why would he call them "model-theoretic *explanations*"? But the role of these explanations is limited to the behavior of ideal systems.

Now, Ellis believes that when we compare the behavior of these ideal systems to actual situations, we have to explain the difference between the two. To do that, we invoke causal process explanations: "[We] pick out some factors …[and] argue that they are *sufficient* to account for the difference to be explained."[136] The framework principles will not "*themselves be ingredients of these explanations. Hence there is no ontological commitment to the existence of these ideals.*"[137]

This gets us to the argument Ellis offers for why causal process explanations *are* committed to the entities they invoke. Ellis begins his argument as follows:

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even commit one to the existence of the entities such a statement purports to refer to. Ellis, unfortunately, does not help us adjudicate this issue, for he never says outright that model-theoretic explanations have to be taken as false.

[136] Ellis, p. 24.

[137] Ellis, p. 25.

If A is agreed to be the best account that can be given for

> the occurrence of some event E, and A is otherwise a satisfactory theory, then the entities postulated in A as the *causes* of E must also be thought to exist. To say that it is just *as if* they existed would always be to weaken the explanation, for it would immediately raise the further question why this should be so; and the realist answer, 'Because they *do* exist', would appear to be the only satisfactory one. We should, therefore, always be realist about the theoretical entities postulated to exist in the causal process theories we accept.[138]

So, the only acceptable response to the question "why does theory A explain event E?" is that the causes (or the entities thought to possess causal powers) referred to in A actually exist.

But why does this argument only apply to the entities referred to in causal process explanations, and not to the entities referred to in model-theoretic explanations? According to Ellis, this is

> because of the roles these entities [the entities

[138] Ellis, pp. 57-58.

> referred to in causal process explanations] are supposed to have in bringing about what is to be explained. In these cases, it can truly be said that the world behaves as if these things existed, because the explanation we are offering shows how the events to be explained appear to be causally dependent on the entities we have postulated.[139]

So if I understand Ellis correctly, it is the *causal role* these entities play that provides the rationale for us to be realist about them. Causal process explanations are committed to the entities they refer to because these entities have causal powers.[140]

Let's now have a brief look at a few of the entities Ellis takes to exist.[141] He deals with them kind by kind. To begin with, physical entities are real. The term "physical entity" includes everything that possesses energy (material objects, fundamental particles, but also force

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[139] Ellis, p. 58.

[140] In my view, what is unclear about Ellis' argument is why he focuses so much on the causal powers of entities in the context of causal process *explanations*, and not simply on the causal powers of entities, period. For it is this focus on explanation, in particular, the attempt to distinguish between explanations that are true and explanations that are not, is precisely what I think gets him into trouble (see section 4).

[141] This list will be incomplete.

fields).[142] Moreover, Ellis is committed to the existence of properties and relationships since in his view, both of these have effects.[143] As some properties are quantitative in nature, quantitative universals are needed as well.[144] Finally, numerical relationships are real. But this "does not imply realism about numbers."[145] That is because numbers "belong to the theory of *possible* numerical relationships, and so are not supposed to be causally effective."[146]

Among the entities that Ellis does not take to exist are abstract objects such as numbers and sets. A table may have the property of being three feet high, but that, for Ellis, does not imply the existence of the number three. Abstract objects do not have any causal powers: "The world

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[142] Ellis, p. 61.

[143] Ellis says next to nothing about how it is that properties and relations have effects. His only remark here is this: "The main argument for realism about theoretical entities requires us to be realists, not only about forces, but about other kinds of physical properties and relationships as well. For there are many different effects which forces may have, depending on the physical properties and relationships of their sources and objects." (P. 71)

[144] Ellis, p. 73.

[145] Ellis, p. 76.

[146] Ellis, p. 77.

we can know about would be the same whether or not they existed."[147]

4. The Facticity of Explanation

I think it is evident at this point that one of the assumptions both Cartwright and Ellis rely on in their argumentation is that we can draw a distinction between explanatory statements that are true and explanatory statements that are false. They both argue that only explanatory statements that refer to entities with causal powers are even candidates for being true, and that is why only the entities referred to in these true explanatory statements exist. Explanatory statements that employ fundamental laws (for Cartwright) or framework principles (for Ellis) are, strictly speaking, false, and the entities these statements purport to refer to do not exist.

One way to motivate the view that explanatory statements can be false is a challenge that, according to Cartwright, Duhem and van Fraassen raise for explanations. As she summarizes it, Duhem and van Fraassen ask why, in cases where "x explains y and y is true", it should also follow that x - the explanans - is true. In their view,

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[147] Ellis, p. 79. Ellis ontology looks very similar to that of Armstrong.

this is not the case.[148] Van Fraassen believes that it is in fact rather common that a false theory is taken to have explanatory value, and he provides the following example:

> Darwin explicitly allows explanations by false theories when he says 'It can hardly be supposed that a false theory would explain, in so satisfactory a manner as does the theory of natural selection, the several large classes of facts above specified'.[149]

Part of Cartwright's project then is to argue that while Duhem's and van Fraassen's claim is true of explanations that invoke fundamental laws, it is *not* true of explanations that invoke phenomenological laws.[150] In the case of the lemon tree example Cartwright gives, it *does* follow that x is true.[151]

According to the facticity of explanation, however, there cannot be any false explanatory statements. The view that all explanations are factive is the view that for a

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[148] Cartwright, 1983, p. 4. For a more detailed discussion on this, see essay five in that volume. For van Fraassen's own discussion, see his 1980, pp. 97-101.

[149] Van Fraassen, 1980, p. 98.

[150] Cartwright, 1983, p. 4. Also see essay five in that volume.

[151] Ellis does not make mention Duhem or van Fraassen, but since he rejects the idea that model-theoretic explanations

statement to have explanatory value, it must also be true. If this is the case, then the term "false explanatory statement" is a misnomer. There are no such things.

Let's look at some explanatory statements that would - appearances to the contrary - have to be considered false by either Cartwright or Ellis. Cartwright would have to reject the following explanation for the moon's orbit: the orbit of the moon around the earth is largely explained by the gravitational forces that the earth and the moon exert on each other. Not only does this explanation involve graviational forces, which, on Cartwright's picture, do not exist, but also, this is an explanation of an actual phenomenon that makes reference to the law of gravitation. As I explained above, in her view, if the law of gravitation is to explain something actual (such as the moon's orbit), the *ceteris paribus* clause has to be removed, but then the law becomes, strictly speaking, false.

Ellis, on the other hand, would have to reject explanations such as this one: The sum of the interior angles of a triangle is 180 degrees. This explains why the angle γ of a triangle in which the angles α and β are each

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should be taken as literally true, he might think that something like their view is true of those explanations.

65 degrees is 50 degrees. Euclidean lines, spaces, and angles, for Ellis, do not exist. Explanations that make reference to entities like these are model-theoretic explanations, and according to Ellis, model-theoretic explanations should not be taken as literally true.

Now compare these two explanations to the following "explanation" for why my watch keeps time: there are elves inside my watch, and these elves make sure that my watch works accurately. This example is due to Levin, 1984.[152] Levin doesn't say what these elves do, but let's suppose that they keep the little wheels inside the watch running by continuously pedaling on tiny bicycles.

Clearly, we do not think of *that* statement as an explanation for why my watch keeps time. We do, however, think that the statement about the moon's orbit and the statement about the angles of the triangle are explanations. Why? Levin provides one possible answer:

> Explanations must be true - the most fascinating story about elves in my watch, which rigorously entails the explanandum of my watch keeping time, cannot explain why my watch keeps time for the simple reason that it

[152] Levin, 1984, p. 127.

is untrue.[153]

So if Levin is right, then if the statement about the moon's orbit and the statement about the angles of the triangle are explanations, then they are also true. But what reason can we offer for this? What reason can we offer for why Cartwright's and Ellis' view that explanations can be false is mistaken?

Well, according to Azzouni (2000), to think that the term "explanation" can apply to statements that are false "does not correspond to how it [the term "explanation"] is used by scientists (or, for that matter, by ordinary people)."[154] In English, the term "explanation" is factive.[155]

In Azzouni's view, while it may be tempting to see only some explanations as factive, for instance, because there are often competing explanations for a particular phenomenon, and our intuitions tell us that only the one in

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[153] Ibid.

[154] Azzouni, 2000, p. 61.

[155] Perhaps it could further be argued that it is part of the meaning of "explanation" that an explanation must also be true. But I'm not sure how that argument would be made, so I'm just going to stay with the argument from the ordinary English usage of the term.

"first place" should be true,[156] that view cannot be sustained. For Azzouni,

> [I]f you ask for an explanation of A, and I tell you something, B, and then add that B is false, you can respond: "B *would* explain A, if B were true." If I have been using B as an explanation of A, and subsequently learn that it is false, I stop doing so; I can no longer offer it to others *as an explanation*.[157]

So it seems that "explanation", as it is ordinarily used, is a factive notion. Therefore, if we thought that the statement "the orbit of the moon around the earth is largely explained by the gravitational forces that the earth and the moon exert on each other", or the statement "the sum of the interior angles of a triangle is 180 degrees" were false, then we just wouldn't offer them as explanations.[158]

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[156] Ibid.

[157] Ibid.

[158] Ruben's (1990) view of explanation also suggests that explanations are factive. This is because he takes it that the relata of explanations are facts (1990, chapter V), and that *all* explanations are causal (chapter VI), which is not the view advanced by either Cartwright or Ellis. Moreover, Ruben believes that both Aristotle's and Hempel's (1948 and 1965) accounts of explanation take explanatory statements to be true (p. 139).

The current state of play, then, is this: an "explanation" that isn't true really isn't an explanation at all, and the way we ordinarily talk speaks in favor of this understanding of the term. According to the way we use "explanation", all explanations are true. And that is why there are neither false, nor potentially true, explanatory statements. Explanatory statements are true, *simpliciter*.

Let us now get back to the criterion of causal explanation. To review, the criterion of causal explanation says that an entity exists if and only if it is referred to in a causal explanation. This implies that if an entity is referred to only in an explanation that is not causal (for Cartwright, these are explanations that involve fundamental laws, for Ellis, these are model-theoretic explanations), it is not real. As I explicated their views, the reason Cartwright and Ellis offered for why non-causal explanations are not ontologically committing was that these explanations, in their view, are not true.

But if all explanations are true, then this last claim must be incorrect. Either non-causal statements can have an explanatory role, in which case they are true, or they are not true, in which case they cannot have an explanatory role. But no statement can have an explanatory role and

also be false. Therefore, the view that there can be such a thing as a non-causal *explanation*, has to be given up.

The above examples suggest that non-causal statements indeed have an explanatory role. That is, the statement that made reference to the orbit of the moon, and the statement that made reference to the interior angles of a triangle, explain certain phenomena, or certain facts. And according to the facticity of explanation, they are therefore true.

What consequence does this have for the criterion of causal explanation? As it is formulated, the criterion is not acceptable, precisely because it implies that there are such things as false explanations. Thus, this criterion has to be reformulated. There seem to be two possible ways of doing that. The first possibility is that we simply drop the word "causal" from our formulation, thus changing the criterion to "an entity exists if and only if it is referred to in an explanation of a phenomenon". This corresponds to how the criterion of best explanation is formulated (see I.2). We will look at this criterion for what exists in the next chapter.

If Cartwright and Ellis were to accept this new formulation, however, they would end up being committed to the existence of entities they explicitly claimed aren't

real. According to this criterion for what exists, Cartwright would be committed to gravitational forces, and Ellis would be committed to Euclidean lines, spaces, angles, and probably also numbers, since there surely are many explanations that involve those as well.

Let us therefore consider the second possibility: we drop reference to explanation altogether in how our criterion is formulated, and change it to something like: "and entity exists if and only if it has causal powers". This amounts to the causal criterion for what exists as it was formulated in the previous chapter, and I think that this might better correspond to the ontologies Cartwright and Ellis argue for. For Ellis, this seems correct because the entities he sought to exclude from his ontology were numbers and Euclidean lines, points, and spaces, none of which are generally thought to have causal powers. Whether or not Cartwright would accept the causal criterion for what exists depends on whether or not she thinks gravitational forces have causal powers. On this point, I am simply not sure.

Chapter V. Best Explanation

1. Introduction

The next criterion for what exists we are going to look at can be developed from Harman's (1965 and 1977) discussion of inference to the best explanation. Harman himself never offers best explanation as a criterion for what exists, but as we'll see shortly, he does argue against the existence of moral facts on the basis that these facts are not needed to explain moral observations, and he argues for the existence of some theoretical and mathematical entities on the basis that they *are* needed to explain observations. If we develop a criterion for what exists from his line of argument, it might read this way: an entity exists if and only if it is needed in the best explanation of an observation.

But we cannot leave this formulation as it is, because this formulation will immediately come up against two objections. One, the term "observation" in our definition suggests that the entities that explain a phenomenon that has not been observed do not exist. But this is obviously false. Nobody has yet observed phenomena on distant planets, for example, and perhaps nobody ever will. But we don't therefore conclude that the entities that explain

these phenomena don't exist. So I would suggest that instead of using the term "observation", we use "phenomenon" instead. Thus, our criterion should read: an entity exists if and only if it is needed in the best explanation of a phenomenon.

The second objection is related to the first, but it is more serious. Again, as I pointed out in II.2, if best explanation is taken as a criterion for *what exists*, nothing would exist in a world that does not have explanations. In order to circumvent this problem, I limited all the criteria for what exists to providing necessary and sufficient conditions for the *actual* world *only*. In *this* world, explanations do exist, and therefore, according to best explanation as a criterion for what exists, there *are* objects that exist in the actual world.

But this response may not be sufficient in the case of best explanation as a criterion for what exists. For even in this world, there are phenomena we have not yet explained. For example, on occasion, a person dies from as of yet unknown causes. But it certainly seems wrong to conclude from this that the causes that *would* explain the person's death are not real *until* we have discovered what they are and formulated an explanation based on them. It seems very strange to say, for instance, that if a person

died from an as of yet undiscovered virus, and we therefore don't yet have an explanation for why the person died, the virus the person died of does not exist.

I actually have doubts that this objection can be addressed by a reformulation of this criterion. But I do think that someone who advocates a criterion along these lines, that is, someone who believes that explanation has an ontological role of roughly the sort sketched out above, will have to find a response to it.

In the next section of this chapter, I will provide a short presentation of Harman's work on explanation. Harman's discussion has generated an enormous industry, both in ethics and in the philosophy of science.[159] But probably the most famous use of explanation is its application as a defense for scientific realism. This can be found in Putnam (1978) and Boyd (1983), but also in Glymour (1984) and McMullin (1984). This use of explanation is then criticized by Fine (1984) and it is

[159] Here's a sampling: van Fraassen (1980), Cartwright (1983), Fine (1984), Sturgeon (1985 - Harman replies to Sturgeon in his 1986), Quinn (1986), Sayre-McCord (1988), Ben-Menahem (1990), Lipton (1992), and Stroud (2000). A more general discussion of "best explanation" can be found in Mackie (1976) and T. Nagel (1986). Sturgeon and Sayre-McCord specifically criticize Harman's application of "best explanation" to the case of values.

also what's at issue for van Fraassen, Cartwright and Hacking.[160]

My discussion of explanation will skirt most of this debate because I want to focus on how best explanation can be used as a criterion for what exists (and it has not literally been proposed as such in the literature above). I also want to spend some time on the issue of what criterion for the commitments of a theory a proponent of best explanation as a criterion for what exists might want to adopt (section 3). Unsurprisingly, more than one criterion for the commitments of a theory is again available to suit this task.

2. Harman

In his 1977, Harman argues against the existence of moral facts by utilizing best explanation as a way to carve out what is real. Harman's thesis is that moral principles cannot be tested and confirmed in the way that scientific principles can.[161]

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[160] Van Fraassen's critique of explanation - his point that explanations need not be true - was touched on in the last chapter. I will not raise it again here, though it will not have escaped the attentive reader that the facticity of explanation is devastating to van Fraassen's view.

[161] Harman, 1977 (in Sayre-McCord, 1988), p. 119.

In general, "one infers, from the fact that a certain hypothesis would explain the evidence, to the truth of that hypothesis."[162] For example, we can infer that "the butler did it" is true because it explains the evidence.[163] According to Harman, such inferences work well when we test scientific hypotheses, but they do not work when we try to test the hypotheses of ethics.

Illustration: imagine you see that "some children pour gasoline on a cat and ignite it."[164] Based on this, you form the belief that the children did something bad. What would explain that belief? Harman examines two hypotheses. The first is that what the children did was in fact bad and that you observed this. This hypothesis involves reference to moral facts, in particular, to the fact that putting the cat on fire is bad. If this were indeed true, it would (in Harman's view) commit us to the existence of such facts.

The second hypothesis makes reference only to your psychology or to your moral sensibility. Harman doesn't say exactly how this should be cashed out, but here's a possible suggestion: we're trained, since childhood, to

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[162] Harman, 1965, p. 89.

[163] This is Harman's example (1967, p. 89).

[164] Harman, 1977, p. 120.

condemn the suffering of pets. So when we see a cat being tortured by kids, we judge that this is wrong. What explains the observation, in this case, is our own psychology, not the *fact* that suffering is bad.[165]

It is clear that this second hypothesis involves fewer ontological commitments than the first because it does not make any reference to moral facts. Furthermore, in Harman's view, such a hypothesis also explains your belief that what the children did was wrong. The first candidate is thus rejected: "you do not seem to need to make assumptions about any moral facts to explain the occurrence of the so-called moral observations I have been talking about."[166]

Harman then compares the example of the cat to an example from science: a physicist sees a vapor trail in a cloud chamber and observes "[t]here goes a proton". According to Harman,

his observation confirms his theory, a theory that

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[165] This is only one of many possible ways to fill in the details about what might be going on in our psychology (or moral sensibility) that causes you to believe that the children did something bad. But how exactly the point is made does not really matter, for the contrast here is between an explanation that involves moral facts and one that doesn't.

[166] Harman, 1977, p. 121.

> helps give meaning to the term "proton" as it occurs in his observational judgment. Such a confirmation rests on inferring an explanation. He can count his making the observation as confirming evidence for his theory only to the extent that it is reasonable to explain his making the observation by assuming that, not only is he in a certain psychological "set" given the theory he accepts and his belief about the experimental apparatus, but furthermore, there *really was* a proton going through the cloud chamber, causing the vapor trail, which he saw as a proton.[167] [emphasis mine]

The theory about protons is therefore confirmed because an explanation was inferred. Furthermore, this explanation involves the assumption that there "really was" a proton. Protons thus exist.

At this point one might wonder, as N. Cartwright has, whether or not Harman's picture actually yields an ontology that is any different from the one that the criterion of causal explanation yields (or would yield, if it could be made to work).[168] After all, the explanations Harman

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[167] Harman, 1977, pp. 121/122.

[168] Cartwright, 1983, p. 85.

accepts all seem to be causal: it is our psychology or moral sensibility that causes us to think that what the children did was bad. And the proton causes us to see a vapor trail in the cloud chamber. Some explanations that do not involve entities with causal powers, such as explanations that make reference to moral facts, on the other hand, are rejected.

But this is too swift. Harman does seem to think that mathematical principles explain observations even though we "cannot perceive numbers, for example, since we cannot be in causal contact with them."[169] Harman says that

> in explaining the observations that support a physical theory, scientists typically appeal to mathematical principles. On the other hand, one never seems to need to appeal in this way to moral principles. Since an observation is evidence for what best explains it, and since mathematics often figures in the explanations of scientific observations, there is indirect observational evidence for mathematics.[170]

It would stand to reason, then, that the mathematical entities needed to explain the observations that support physical theory are real.

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[169] Harman, 1977, P. 124.

One last, but rather important, exegetical point: as I said above, Harman, in the texts I discuss here, does not propose explanation *as* a criterion for what exists (he certainly does not use those words). But as we've now seen, explanation clearly does play *some* sort of an ontological role (loosely put) for Harman. After all, what explained the physicist's observation of the vapor trail in the cloud chamber, according to Harman, was that there *really was* a proton. However, there's perhaps more than one way to understand what this ontological role actually amounts to.

The first way to understand what this ontological role comes to, is that Harman has in mind something like a criterion for what exists in the way I've constructed it here. In other words, Harman is exploiting the intuition that an entity is real if and only if it has explanatory power. But perhaps, Harman might be better understood as offering a somewhat weaker criterion, namely, a criterion for what entities we should *believe* exist, rather than a criterion for what entities *do* exist. So perhaps we should think of him as arguing that we should *believe* an entity exists if and only if it is needed in the best explanation of a phenomenon, rather than, that an entity *does* exist if

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[170] Ibid.

and only if it is needed in the best explanation of a phenomenon.

In other words, we should *believe* that numbers exist because they are needed in the best explanation of a phenomenon, and we should *believe* that moral facts do not exist because they are not so needed. Let use call such a criterion an "epistemic criterion" so that we can distinguish it from the metaphysical criteria we are interested in here.

Although I don't know if there's sufficient textual evidence to support either of these interpretations of Harman, it is at least possible that understanding Harman as only offering an epistemic criterion better describes what he actually had in mind. We, on the other hand, are not interested in epistemic criteria of this sort, but in metaphysical criteria, that is, we are interested in criteria for what exists. We therefore need to ask ourselves whether *we* have any additional motivation for constructing a criterion for what exists from his arguments, regardless of what Harman had in mind.

I think we do have such motivation, because a metaphysical criterion (a criterion for what exists) may be needed in order to argue for the correctness of best explanation as an epistemic criterion. This is because an

advocate of explanation as an epistemic criterion should say something about *why* one should believe in an entity if and only if it is needed in the best explanation of a phenomenon, and for this, he may actually need to adopt a criterion for what exists.

Let me elaborate. We start with the observation that there may be other epistemic criteria available besides the one under consideration here. Someone might want to argue, for example, that one has reason to believe in an entity if and only if it can be used to intervene in scientific processes. That is something I think Hacking would say (see III.2). Someone else might want to argue that one has reason to believe in an entity if and only if that entity is indispensable to the practice of science (perhaps this view could be attributed to Field and Resnik - I summarized their position briefly in chapter one - a detailed discussion of this criterion, however, will not be undertaken until the next chapter).

But how would we adjudicate between these different epistemic criteria? What would help us decide which of these epistemic criteria is correct? Well, one way of doing so (perhaps the only way) is to offer a criterion for what exists to back up the epistemic criterion one thinks is correct. In particular, the argument for best

explanation as an epistemic criterion might go like this: the only entities that *in fact* exist are the entities that are needed in the best explanation of a phenomenon. Therefore, those are the only entities we should *believe* exist. We should not believe in witches because witches are not needed in the best explanation of any phenomenon, and the only entities that exist are entities that are so needed. We should believe in numbers because numbers are needed in the best explanation of phenomena. And if an entity is so needed, it is real.

But if this is the argument, then it is an underlying metaphysical criterion (a criterion for what exists) that gives the epistemic criterion bite. So, while I'm not prepared to argue that Harman should be understood as offering a criterion for what exists, I think that there is at least some motivation for us to construct such a criterion from his arguments.

3. On Criteria for the Commitments of a Theory

I now want to discuss how some of the available criteria for the commitments of a theory can be made compatible with best explanation as a criterion for what exists.

In III.3, I explained that in my view, if someone holds that a particular statement is true, then he should

also accept that the objects that statement is ontologically committed to (if any) are real. It would then follow that, if someone adopts best explanation as a criterion for what exists, for him, a true statement is one that can only be ontologically committed to entities that are needed in the best explanation of a phenomenon. And if a statement is committed to entities that are not needed in the best explanation of a phenomenon, it is false.

The question we thus need to turn our attention to is *which* criteria for the commitments of a theory are best suited for a proponent of best explanation as a criterion for what exists.

Let's start again with Quine's criterion. If the proponent of best explanation as a criterion for what exists takes it that a statement is committed to the entities that fall within the range of the existential quantifier, then this would have the following consequence: he would have to regard all those statements as false that quantify over entities that are not needed in the best explanation of a phenomenon.

A second candidate criterion for the commitments of a theory is again a version of the predicate approach to ontological commitment (one that is not identical to Quine's criterion). To review, on the predicate approach

to ontological commitment, one takes a statement to be committed only to those entities that are quantified over *and* to which a particular predicate applies.

Now, which predicate might we recommend to the proponent of best explanation as a criterion for what exists? One suggestion is the predicate "has explanatory power". On this view, a theory would be committed to all and only those entities that are quantified over *and* to which the predicate "has explanatory power" applies.

A possible advantage of this criterion for the commitments of a theory is that it would not require that the proponent of best explanation as a criterion for what exists take any statement that quantifies over entities that are not needed in the best explanation of a phenomenon as false. Of course he may want to do so anyway in the case of statements that quantify over elves or phlogiston, because there are other reasons for taking such statements as false. For instance, we have very good scientific reason for rejecting the theories that include statements that quantify over elves or phlogiston. But in the case of statements that quantify over Euclidean lines or spaces, one could argue that we have at least prima facie reason for taking some of these statements as true. These reasons

stem from mathematical practice: mathematicians can *prove* that some of these statements are true.

These observations would seem to suggest that the predicate "has explanatory power" is perhaps the better criterion for the commitments of a theory to employ here, for the reason I gave in the previous paragraph: the proponent of best explanation as a criterion for what exists would not have to label statements that quantify over entities that are not needed in the best explanation of a phenomenon as false (and this is a good thing if we have prima facie reason for taking some of these statements as true). However, I'm not going to press this point here.

Chapter VI. Indispensability

1. Introduction

We will now look at the last criterion for what exists surveyed in this project: indispensability. Indispensability, once again, is not literally offered as a criterion for what exists in the philosophical literature, but indispensability claims *are* employed in arguments for or against the existence of certain classes of entities (largely, they are employed in arguments for or against the existence of the entities of mathematics).

Let me start by providing a few formulations of what, in the literature of the philosophy of mathematics, has come to be known as the "Quine-Putnam indispensability thesis." First, here's Putnam's (1971) own version:

> [Q]uantification over mathematical entities is indispensable for science, both formal and physical; therefore we should accept such quantification; but this commits us to accepting the existence of the mathematical entities in question.[171]

Field's (1989) description of the indispensability thesis is more general. I first gave it in chapter I:

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[171] Putnam (1972), p. 347 in his 1995.

> An indispensability argument is an argument that we should believe in a certain claim (for instance, a claim asserting the existence of a certain entity) because doing so is indispensable for certain purposes (which the argument then details).[172]

As we can see, Field formulates the indispensability thesis in terms of taking certain claims, or statements, as true, rather than in terms of taking certain entities to exist. In order to make the further claim that certain entities exist because the statements that refer to these entities are true, he needs to adopt a criterion for the commitments of a theory (this issue was discussed in II.5).

Field makes clear which criterion for the commitments of a theory he has in mind, and as far as I know, this criterion is never in doubt in his writings. Field accepts Quine's criterion for the commitments of a theory. In explaining his nominalist program, he states that

> [s]ince I deny that numbers, functions, sets, etc., exist, I deny that it is legitimate to use terms that purport to refer to such entities or *variables that purport to range over such entities*, in our ultimate account of what the world is really like.[173] [emphasis

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[172] Field, 1989, p. 14.

mine]

Lastly, here's an indispensability argument due to Resnik (1995):

> mathematics is an indispensable component of natural science; so, by holism, whatever evidence we have for science is just as much evidence for the mathematical objects and mathematical principles it presupposes as it is for the rest of its theoretical arguments; whence, by naturalism, this mathematics is true, and the existence of mathematical objects is as well grounded as that of the other entities posited by science.[174]

Again, to get from the premise that mathematics is true to the conclusion that mathematical objects exist requires a criterion for the commitments of a theory, and the criterion that Resnik accepts is Quine's as well. In a footnote, Resnik refers to the "existential force" of "there is…" claims.[175] There, he considers, *but then rejects*, the idea that "there is…" claims might not be

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[173] Field, 1980, p. 1.

[174] Resnik, 1997, p. 45.

[175] Resnik, 1997, pp. 40/41.

taken to have the existential force they seem to be wearing on their sleeves.[176]

Before moving on, I want to make a few observations. One, it seems clear that all the philosophers I have quoted here accept the same criterion for the commitments of a theory, namely Quine's. For this reason, I am not going to discuss any possible rival criteria for the commitments of a theory in this chapter. However, some of the arguments we will look at here are going to be revisited in chapter VIII, and in that chapter, the reliance of these philosophers on Quine's criterion (in particular, Resnik's reliance) shall very much concern us.

Two, it is also clear that scientific practice plays an important role in how the indispensability thesis is formulated. On this point, the proponents of the indispensability thesis (in more or less explicit ways) are also of one mind. Putnam and Resnik make this explicit in the quotes I chose, and while Field's quote is not clear on this, his 1980 is devoted to sketching out a program that

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[176] Another proponent of the indispensability thesis is Colyvan. He formulates it in this way: "If apparent reference to some entity (or class of entities) Ę is indispensable to our best scientific theories, then we ought to believe in the existence of Ę." (Colyvan, 2001, p. 7)

shows that one need not quantify over numbers in certain parts of Newtonian Theory.[177]

Now, how can the indispensability thesis be developed into a criterion for what exists? Let us start with the following, very rough, working formulation: a class of entities exists if and only if it is indispensable to science.[178] As I have formulated it here, this criterion is again a metaphysical criterion, and this represents a clear jump from the indispensability thesis, which, as the above quotes show, is more epistemically cast. I am therefore not in a position to claim that the philosophers I discuss here are committed to this metaphysical criterion. But as we will see below, this metaphysical criterion is not quite

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[177] In particular, Field tries to show "how in the context of certain physical theories (field theories in flat space-time) one can develop an analogue of the calculus of several real variables that does not quantify over real numbers or functions or any such thing." (Field, 1980, p. 2)

On a separate note, Colyvan (2001, p. 11) says, "it thus seems reasonable to take *science*, or at least whatever the goals of science are, as the purpose for which mathematical entities are indispensable." (Emphasis mine.)

[178] I am using "class of entities", rather than just "entity" in this formulation of the criterion because, as I said above, defenders of the indispensability thesis largely seem to be arguing for or against the existence of certain classes of entities, such as the class of mathematical entities (but a class of entities could also contain just one item).

as far away from the actual position of the defenders of the indispensability thesis as it seems at first glance.

Before we can get to this, however, we must look at some obvious difficulties this formulation of the criterion of indispensability faces (difficulties that are reminiscent of the ones we encountered in the previous two chapters). We will need to refine our criterion in certain ways to try to account for those.

To start with, I take it that the intuition that underlies indispensability claims is this: science is supposed to represent the world the way it actually is. Therefore, whatever objects, or classes of objects, are *in*dispensable to the way science represents the world must also be real. Furthermore, whatever objects, or classes of objects are *not* indispensable to the way science represents the world are *not* real.

I think that if we formulate it as a criterion for what exists, indispensability, too must be understood as presenting both necessary and sufficient conditions for what exists, for otherwise, this criterion could not be used to rule out the existence of certain objects. It would only tell us that if an entity, or a class of entities, is indispensable to science, it exists, but it

would not tell us that an entity, or a class of entities, that is not indispensable to science, it does not exist.

I remind the reader that this criterion is also supposed to hold only for this world, and not for all possible worlds. Therefore, we need not be concerned with a world in which there is no science (because, for instance, the world is uninhabited), or a world in which the scientific laws are different. But there is a related worry we do have to address. And that is the undeniable fact that science - in this world - constantly changes. Entities that were at one point *in*dispensable to scientific practice (such as phlogiston) are now no longer needed. In some cases, this is because the theories that made reference to such entities have been refined in such a way that they no longer refer to those entities. In other cases, these theories have been rejected altogether.

For this reason, we have to make it clear that indispensability, as a criterion for what exists, should perhaps not be understood as dependent on science as it is currently practiced. We should therefore add a qualifier to how it is formulated: we should say that a class of entities exists if and only if it is indispensable to the part of science that is true (although there is of course a small possibility that none of it is). Alternatively, we

could say that a class of entities exists if and only if it is indispensable to the part of science that describes the world the way it actually is (although again there is a small possibility that none of it does). We may not yet know which parts of science (if any) are true, or which parts of science (if any) describe the world the way it actually is, but that does not matter.

We can see why this doesn't matter if we compare this criterion to the causal criterion for what exists (chapter II). For the proponent of the causal criterion for what exists also does not necessarily know *which* entities have causal powers. However, this does not prevent him from claiming that an entity exists if and only if it has those causal powers. He may have evidence of the causal powers of some entities. We've seen, for example, that Hacking believes that the causal powers of certain entities are demonstrated to us when we use these entities to intervene in nature. But of course we may revise our picture as to what the entities are, that can be so used.

Now, is this revised formulation of indispensability as a criterion for what exists really immune from difficulties? Unfortunately, it is not. There's a residual worry that I'm not sure can be so easily addressed. For one may ask: what exactly is meant by

"science"? Don't we, by "science", mean "scientific *theories*"? And aren't theories sets of statements? But if that is the case, the worry we just thought we had addressed reappears in a different form.

This is because if we substitute "scientific theories" where the word "science" occurred in the formulation of indispensability as a criterion for what exists, we get the following: a class of entities exists if and only if it is indispensable to the part of scientific *theories* that are true. And this makes what exists dependent upon there being scientific theories, which are discovered and formulated *by us*. This, in my view, also explains why the indispensability thesis is epistemically cast. First of all, it is us who formulate these scientific theories. And secondly, a question that must now be addressed is what the *reasons* are that one can provide for *why* certain theories are true (we will look at some of these reasons in the next section - in particular, we will look at some of the reasons for taking mathematical discourse as true, as well as for treating mathematical discourse as false).

Now although in this world we do have scientific theories, it still seems strange to formulate a criterion for *what exists*, which is supposed to hold true of the world as it is *independently of us*, in such a way as to

make it dependent upon our scientific theories. My preliminary conclusion is therefore that indispensability, as a criterion for what exists, is problematic unless it can be formulated in such a way as to avoid the preceding problem.

In the remainder of this chapter, I will discuss the views of two of the main proponents of the indispensability thesis: Field and Resnik. Although both philosophers accept the indispensability thesis, and both philosophers agree that Quine's criterion for the commitments of a theory is correct, Resnik is a Platonist and Field a nominalist with regard to mathematics. Field believes that mathematics will prove *not* to be indispensable to science, and furthermore, that the statements that quantify over the objects of mathematics are false, and Resnik believes that mathematics *is* indispensable to science, and that the statements that quantify over the objects of mathematics are candidates for being true.[179]

It very much appears, then, that indispensability, as a criterion for what exists, is compatible with more than

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[179] Actually, Resnik only believes that mathematical "structures" exist and that these must be distinguished from mathematical objects like numbers. The discussion of what he takes these structures to be can be found in his 1997. It will not concern us here. However, I will

one ontology. It is compatible with an ontology that includes the objects of mathematics, and it is compatible with an ontology that excludes them. This criterion alone therefore does not settle which ontology is correct. In order to settle what there is, one must adopt a criterion for what exists, a criterion for the commitments of a theory, and one must also decide which theories should be accepted as true.

2. One Criterion - Two Ontologies

We now turn our attention to Field's and Resnik's respective positions. As we'll see in a moment, these philosophers provide us with some compelling philosophical (not mathematical) motivations *for* taking the objects of mathematics as real, as well as with some philosophical compelling motivations *against* doing so. And this has certain obvious consequences for whether or not the statements that quantify over these objects should be taken as true.

In this section, I will not undertake an evaluation of Resnik's or Field's position. I am more interested in further exploring the claim that indispensability, as a

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provide some of Resnik's quotes that explain what these structures are in the footnotes on the next few pages.

criterion for what exists, is compatible with more than one ontology. Thus, I will limit myself to a brief summary of Resnik's and Field's views and how they are motivated. We will then have another look at these motivations in chapters VII and VIII.

In order to see what motivates Field and Resnik, we have to begin with Benacerraf. In his 1973, Benacerraf argues for the following well-known thesis: the most reasonable view about mathematical truth "does not mesh with" the most reasonable view about mathematical knowledge.[180] To show this, Benacerraf first presents arguments to the effect that we should strive for a uniform theory of truth for both mathematical and empirical statements. He provides us with the statement pair

(1) "[t]here are at least three large cities older than New York" and

(2) "[t]here are at least three perfect numbers greater than 17",[181]

and then observes that both these statements have the same logical and grammatical form. This provides the motivation

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[180] Benacerraf, 1973, p. 403.

[181] Benacerraf, p. 405.

for treating them alike with regard to their truth conditions.

Applying the same truth conditions to both these statements requires that if we hold that the first statement is true if and only if "certain cities stand in certain relations to each other,"[182] then, for consistency's sake, we must also hold that the second statement is true if and only if certain numbers stand in certain relations to each other. That is, if the first statement is true if and only if *there are* at least three large cities older than New York, then the second statement is true if and only if *there are* at least three perfect numbers greater than 17.

Now, under the assumption that the second of these statements is true, application of Quine's criterion for the commitments of a theory yields the result that *there are* at least three perfect numbers greater than 17.[183]

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[182] Benacerraf, pp. 405/406.

[183] This last claim will not be found in Benacerraf, however. In his article, he does not discuss Quine's criterion for the commitments of a theory. Related to this, there's a possible objection one might make about the need for Quine's criterion here. One might argue that "there is" statements in ordinary English already commit us to the existence of the object the phrase "there is" refers to. But as I tried to show in II.4, ordinary speakers do not always take "there is" statements to be ontologically committing.

Benacerraf then notes that the best theory of knowledge available is the causal theory[184] (we should note that this is in 1973; and we will see in a moment that this has since changed): for a person to know about X is for that person to stand in a certain causal relation to X. But numbers do not have causal powers, from which it follows that one cannot know the truth conditions for the statements of mathematics. According to Benacerraf, then, we cannot meet both the demands of a unified theory of truth (that is, the demand that the same truth conditions be applied to both mathematical and empirical statements) and the demands of the causal theory of knowledge.

The dilemma Benacerraf poses has forced most philosophers of mathematics into one of two positions. One the one hand, these philosophers can accept the demand for a unified theory of truth and if they also accept Quine's criterion for the commitments of a theory, they are forced to the conclusion that the objects quantified over in the mathematical statements that are true, are real. But then, they are required to explain how it is possible to know about these objects. That is, they have to replace the causal theory of knowledge with a theory that does not rely on causal access to an entity for us to know about it.

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[184] Goldman (1967).

On the other hand, these philosophers can accept Benacerraf's claim that we cannot know that the truth conditions of statements about numbers hold, but then they have to either adopt a different set of truth conditions for mathematical statements (this is what Benacerraf seems to suggest although he also argues that the combinatorial accounts of truth that are available to this task are problemematic)[185], or they have to claim outright that, appearances to the contrary, the statements of mathematics are false.

The way I see it, Benacerraf's dilemma is also the main dividing line between the views of Resnik and Field. Resnik tells us that Benacerraf's dilemma provides a prima facie case for realism (about mathematical objects):

> [T]he apparent grammatical and logical forms of mathematical existence-claims are the same as those of more mundane existence claims.[186]

Resnik says only that Benacerraf's dilemma gives rise to a *prima facie* case for realism, and *not* that it

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[185] According to Benacceraf, "the leading idea of combinatorial views is that of assigning truth values to arithmetic sentences on the basis of certain (usually proof-theoretic) facts about them." (See Benacerraf, 1973, p. 407.)

[186] Resnik, 1997, p. 41.

conclusively establishes the existence of mathematical objects. Further support for his view that mathematical objects are real comes from the consideration that mathematics works.[187] He says, "[I]f mathematics were just a game or an art we could not explain its usefulness, because we do not *use* …[the objects of art] in the way we use mathematics."[188] He takes this view to be explicated by the indispensability thesis.[189] Still, one of his main motivations is provided by Benacerraf. The rest of Resnik's program then concentrates on describing what he takes mathematical objects to be,[190] and on providing and answer to the half of Benacerraf's dilemma that is left

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[187] Resnik, p. 42.

[188] Ibid.

[189] Justification for the thesis itself is not provided. It is used as a premise in order to justify realism about mathematical entities.

[190] "Mathematical objects", he says, are "featureless, abstract positions in structures (or more suggestively, patterns)." (Resnik, pp. 4/5.) Alternatively, "the entities which our mathematical constants and quantifiers denote, are themselves atoms, structureless points, or positions in structures." (Resnik, p. 201) Certainly, these structures are abstract objects. His paradigm case for structures are geometric points (p. 5).

dangling: how we can know about these objects.[191] We shall not be concerned with this, however.

In contrast to Resnik, Field advocates mathematical nominalism. Field starts by granting that the main reason for believing in the existence of the objects of mathematics is the indispensability thesis:

> It is the fact that mathematics appears indispensable in applications (indispensable without incurring high costs, that is), that provides the main source of arguments for platonism.[192]

However, Field also believes that Platonism has problems. One of these problems is created by the second half of Benacerraf's dilemma. Since the causal theory of knowledge is no longer as widely accepted, however, he

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[191] Resnik's answer has two parts. The first part one might call "postulationalism". Resnik believes that "we gain access to mathematical objects by positing them and correlations between some of their features and concrete computations" (p. 87). If we posit mathematical entities and their properties, then it is easy to see why we would have knowledge about them. The second part is confirmational holism: "no claim of theoretical science, including those of mathematics, can be confirmed or refuted in isolation but only as part of a system of hypotheses" (p. 99). Thus, whenever a part of science is confirmed, the mathematics necessary to state this part of science is confirmed as well.

[192] Field, 1989, P. 8.

rephrases the dilemma in such as way as to avoid it. In his 1989, he says:

> ...Benacerraf's challenge...is to provide an account of the mechanisms that explain how our beliefs about these remote entities [mathematical entities] can so well reflect the facts about them. The idea is that *if it appears in principle impossible to explain this*, then that tends to *undermine* the belief in mathematical entities, *despite* whatever reason we might have for believing in them.[193]

The way Field rephrases the problem does not just avoid reliance on a causal theory of knowledge, it avoids reliance on *any* particular theory of knowledge. Rather, Field wonders how it is possible that our beliefs can be true to the facts of mathematics, or better, how we can explain the reliability of our beliefs about the objects of mathematics.

Field then makes it clear that he considers this apparent impossibility to back up the claim that mathematical objects aren't real. He says that the main motivation for his view that we shouldn't believe in the existence of numbers is that "it avoids having to answer

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[193] Field, 1989, p. 26. I will spend some time analyzing this quote in chapter VIII.

some questions that seem to need answering on a Platonist view."[194] One of these questions is his restatement of Benacerraf's dilemma.[195] Field thinks that if we can't explain how our beliefs about mathematical objects reflect the facts about those objects, then our belief in those objects is undermined.

In other words, Field does not believe that a Platonist can meet Benacerraf's challenge in the way that Field has formulated it. And a look at the literature in this area reveals that most Platonists must work indeed very hard to even try to supply an answer.[196] This is why Field opts for nominalism. Given his commitment to both the indispensability thesis and to Quine's criterion for the commitments of a theory, he must now show that scientific theories can be restated in such a way as to avoid reference to numbers, sets, etc. Field embarks on this program in his 1980. But because it is often

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[194] Field, p. 6.

[195] Field, pp. 25-30. The other question is derived from Benacerraf's (1965) "What Numbers Could not Be." Field says that "there is a tremendous amount of arbitrariness as to the identification of different types of mathematical objects." (1990, p. 20.)

[196] In addition to Resnik, see Hale's 1987 and 1993 as well as Katz's 1998.

impracticable to work with the nominalized version of scientific theory, his commitments further require him to say that strictly speaking, the non-nominalized mathematics that we do use is false.[197]

This concludes our examination of the different criteria for what exists. As I said in the introduction, this is only selection of the criteria available, but it should serve as good set of possible candidate criteria to adjudicate between.

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[197] Field calls his view "fictionalism". Mathematical sentences are only true "*according to a certain well-known story*" (1989, p. 3). That story is, of course, the story of mathematics. It is called "fictionalism" because that is exactly what we would say of fictional statements. They're only true according to the story they're in.

Chapter VII. On the Role of Science

1. Introduction

In this chapter, I want to focus on the question what role, if any, science can play in helping us adjudicate between the different criteria for what exists on offer here.[198] Although science may not play a role in all questions of ontology,[199] I would think that a certain amount of reliance on science in the enterprise of ontology is both natural and desirable. After all, Ellis (1990) reminds us that concerning science,

> there is no other body of knowledge which is as well supported or attested, as thoroughly checked, as precise and detailed in its predictions, as comprehensive and systematic in its explanations, or as satisfying intellectually.[200]

In addition, and much more importantly, science is supposed to give us "objective knowledge of the world".[201] And

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[198] I shall here work under the assumption that at least applied mathematics should be considered part of science, but I understand that this assumption is not universally shared.

[199] A good example would be Davidson's arguments for the existence of events (see Davidson's 1970 for instance.)

[200] Ellis, 1990, p. 19.

[201] Ibid.

shouldn't it then follow, that if *science* treats an entity as real, this provides the best reasons possible for us to also claim that it is real? As Ellis puts it: "One would have to have very good reasons indeed, or be very arrogant, not to accept the scientific viewpoint on questions of ontology as the best there is."[202]

That said, however, it should also be clear at this point that not all of the philosophers surveyed here arrive at the same conclusion as to *which* ontology science actually indicates. Field and Resnik, for instance, disagree on whether the objects of mathematics are indispensable to science. Field believes that scientific theory (or at least some scientific theories) can be formulated without reference to the objects of mathematics, but Resnik seems convinced of the opposite. Cartwright takes science to indicate that there aren't any gravitational forces, while Ellis thinks such forces do exist. Armstrong seems to believe that science confirms the reality of universals. On this point, I can only speculate, but I doubt that the philosophers we examined here, with the exception of Ellis, would agree with that conclusion.

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[202] Ibid.

2. Science as the Final Arbiter

In my view, there are two questions that would have to be answered before science could help us decide what sorts of entities are real, and, a fortiori, before science could help us decide which criterion for what exists is correct. The questions are these:

Question 1: Which scientific theories are true?

Question 2: How are we to read the ontological commitments off of those theories?

Question 1 needs to be answered because, it seems to me, in determining what's real, we'd want to stick to the ontological commitments of the theories that are true, and not to those that are false.[203] This is not to say that a criterion for the commitments of a theory does not apply to false theories. Of course it does. But it seems to me that *we* would certainly want to avoid grounding an argument for the existence of an entity in a theory that is false.[204]

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[203]Of course the ontologies of false theories may be valuable for other reasons (my thanks to Arnold Koslow for pointing this out).

[204] However, some philosophers, as we've seen, avoid scientific theories altogether in presenting arguments for what exists. Hacking, we saw, believes that it is scientific *practice*, not scientific theory, that determines which entities are real (see III.3).

For example, a false theory might be committed to the existence of electrons (take a theory that says that electrons are positively charged particles). But we would not take such a theory to indicate that electrons exist. Insofar as scientific theories are involved providing clues as to what is real, it is only the true theories that are going to indicate what exists, not the false theories. And *that* is why we have to answer the question "which scientific theories are true?".

Now one might think that the answer to the question of what theories are true is best determined by the arguments and resources scientists have to offer (such as scientific experiment and mathematical proof, to name a few). But as the previous chapters have shown, a number of philosophers believe that some scientific theories are *not* true despite the arguments scientists advance to the contrary, which creates an obvious tension that needs to be addressed.

Question 2 is simply the question of which criterion for the commitments of a theory we should adopt. As we've seen throughout this project, which criterion for the commitments of a theory we adopt, matters. To give one more example, take Benacerraf's statement "[t]here are at least three perfect numbers greater than 17". On Quine's criterion, this statement implies the existence of three

perfect numbers greater than 17. If, on the other hand, we take the ontological commitments of a statement to be determined by the predicate "is causally efficacious", then this statement does not imply the existence of three perfect numbers greater than 17, because the predicate "is causally efficacious" does not apply to numbers (unless one believed that numbers had causal powers, but in this project, I have been operating under the assumption that they don't - see I.3).

In chapter II, I said that the most conservative attitude toward criteria for the commitments of a theory is one of neutrality. But this neutrality now poses a problem for how to answer **question 2**, for we can only determine which ontology science indicates as correct if we decide on a criterion for the commitments of a theory. We must hence ask ourselves whether there are any arguments that could drive us to give up this neutrality. In this section, I will argue that there are such arguments, but that unfortunately, we are not licensed to employ them in the present context.

We now turn to the resources one might bring to bear in order to answer the two questions I posed above. We begin with **question 1**: Which scientific theories are true? As we've seen, Nancy Cartwright believes that the

fundamental laws of physics, such as the law of gravity, are actually false. Her reasons for thinking that these scientific theories are false seem to arise from scientific practice *even though* scientists themselves do not actually believe that such theories are false. I don't wish to rehearse all her arguments again, but part of the reason for why she regards such laws as false is because in her view, those laws can only explain in ideal, but not in actual, circumstances. She further believes that these fundamental laws are not confirmed in the way phenomenological laws are.

It is relatively clear that physicists themselves do *not* share this attitude. In the introduction to his *Lectures on Physics* (1963), Feynman makes a distinction between laws that are only *approximately* true and laws that *are* true.[205] For instance, the "constant-mass" law is only approximately true. Some laws are only approximately true because "*we know that we do not know all the laws yet.*" For Feynman, other laws, such as those of relativity theory and four-dimensional space-time, are not approximately true, but simply *true*.[206]

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[205] Feynman, 1963, Part 1, p. 1-1.

[206] Feynman, 1963, p. 1-2.

On Cartwright's picture, Feynman's way of distinguishing between true and approximately true laws, and more importantly, his sorting of which laws fall into which category, is lost. For example, for Cartwright, relativity theory could certainly not be true, because it involves fundamental laws. Thus, with regard to truth, relativity theory is indistinguishable from a theory about phlogiston. And while Feynman does not explicitly distinguish the truth content of phlogiston theory from that of relativity theory, it seems obvious that he would.

Under the assumption that applied mathematics should be considered part of science, both Ellis and Field can also be interpreted as thinking that parts of scientific theory are false. But their reasons differ from the reasons offered by Cartwright. As I explicated them, Ellis' and Field's justification does not come from their understanding of, or their interpretation of, mathematical practice. Rather, they seem to be worried that we would be committed to a number of unwanted entities if the statements of mathematics were true.

As we saw in chapter IV, Ellis believes that ontological commitment is only carried by causal process explanations, and not by model-theoretic explanations. There, I quoted him as saying that model-theoretic

explanations (such as explanations that refer to Euclidean points and lines as well as explanations that refer to numbers) "make essential reference to abstract ideals of one kind or another - things which either do not, or could not, exist in nature."[207] Furthermore, Ellis says "the points, lines, and planes of Euclidean geometry have properties which no physical systems could have."[208]

Field, on the other hand, is motivated to reject the existence of numbers because of epistemic scruples. He thinks that we cannot explain how our beliefs about the objects of mathematics could be true *of* these objects. Therefore, he concludes, our belief in these entities is seriously "undermined".[209]

In the actual practice of mathematics, however, we certainly do find that some statements are thought of as simply true (and not thought of as merely true within the story of mathematics, as Field thinks). Fermat's last theorem is now proven true (while its negation is not). Alternatively, "there are at least three prime numbers greater that nine" is true (whereas "there are only three prime numbers greater than nine" is not). And no textbook

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[207] Ellis, 1990, p. 23.

[208] Ellis, p. 25.

in mathematics features the distinction between true, simpliciter, and true within the story of mathematics that Field speaks of. This distinction, therefore, does not arise from mathematical practice, but is an imposition on it.

What does all this show? Two things. First, there is evident disagreement between what philosophers say and what scientists say about which theories are true. Some philosophers believe that certain scientific theories are false, and this clearly flies in the face of the views scientists have and the justification they offer for them. Second, Ellis' and Field's line of argument illustrate the fact that sometimes, the justification philosophers will offer for why some scientific theories are false stems from their views about what sorts of objects exist (or don't exist, for that matter). Thus, it is the ontology that these philosophers believe to be correct that provides them with the reason for why, in their view, some scientific theories are false.

How should the obvious tension that is created by what scientists say and what philosophers say about which theories are true be resolved? Whose arguments should we heed with regard to how to answer **question 1**? The

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[209] Field, 1989, p. 26.

arguments offered by scientists or the arguments offered by philosophers?

Though I shall not argue for this here, in my view, we should not accept Ellis' and Field's line of reasoning, at least not in the present context, but give priority to the reasons scientists offer for which scientific theories are true. I simply believe that the resources for answering **question 1** that are most consistent with letting science play a role in helping us determine what there is, are the resources offered by scientists. So if we learn (as we have) that mathematicians have proven Fermat's last theorem, then we should accept that Fermat's last theorem is true. Similarly, if we learn (as we have) that physicists take general relativity to be established, then we should accept general relativity. Thus, in the cases in which there is an obvious conflict between what scientists say and the reasons they offer and what philosophers say and the reasons they offer, I would submit that it is prima facie more plausible to give priority to the reasons scientists offer, at least in the context of letting science play a role in telling us what there is.

We now turn to **question 2**: How should we read the ontological commitments off of scientific theories? As I said above, if we remain neutral toward which criterion for

the commitments of a theory to adopt, then we will not be able to decide which ontology is implied by scientific theories. Therefore, we have to ask what arguments there are that could drive us to surrender this neutrality. I now offer some examples to illustrate how I think these arguments would have to go. As I said above, however, I believe that, for reasons that will soon become obvious to the reader, we are *not* licensed to employ these arguments here.

Example 1. Assume a philosopher, call him XY, took it that only entities with causal powers existed. Such a philosopher could go on to argue that the best way to read the ontological commitments off from theories is with the help of the predicate "is causally efficacious". XY could offer the following line of reasoning for adopting this predicate.

First of all, XY thinks that an entity exists if and only if it has causal powers. Therefore, he presumably also thinks that only if the predicate "is causally efficacious" applies to a term, the entity indicated by that term is real. This is because the predicate "is causally efficacious" indicates that the term refers to an entity with causal powers.

Secondly, XY could say that if he were to use Quine's criterion, he would have to label all the statements of scientific theory that involve existential quantification over objects without causal powers (such as numbers or sets) as false. *But*, as we've seen above, if a philosopher wanted to let *science* tell him what there is (and we are currently trying to determine how far that suggestion could be made to work), then perhaps he *shouldn't* label such statements as false. At least he shouldn't if scientists provide good reason for why these statements are true. Thus, Quine's criterion doesn't look like such a good option for him. Rather, it appears that the better option is the predicate "is causally efficacious".

Example 2. Let's say that philosopher XX believes that all and only concrete objects exist (that, incidentally, may well come to the same as the view that only objects with causal powers exist, but I will treat it as a separate option for illustrative purposes). XX could go on to argue that the predicate "is concrete" should carry ontological commitment. Her reasons would be analogous to the reasons XY could give above. And these examples can easily be multiplied. In fact, a predicate (or a set of predicates) could be tailored to fit pretty much any view about ontology whatever.

But this line of argument creates an interesting dilemma for us. It would now seem that in order to decide which criterion for ontological commitment we should adopt, we need to first decide which entities we want to count as real. Clearly, for us to read the ontological commitments off from scientific discourse, we need a criterion for the commitments of a theory. However, before we can know *which* criterion for the commitments of a theory we should use for these purposes, we need to have adopted a criterion for what exists.

Of course I cannot conclusively establish that there are *no* other methods for determining which criterion for the commitments of a theory to adopt, but so far as I can see, the only decisive considerations for or against a particular criterion for the commitments of a theory depend on the prior adoption of a criterion for what exists. While I don't have any further arguments for this, it just seems intuitively right to think that how we determine the ontological commitments of a discourse should depend on *what exists*.[210]

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[210] A philosopher *might* argue that a criterion for the commitments of a theory should simply be developed from an examination of the ordinary English language. Whichever word or phrase is consistently used, in ordinary English, to indicate ontological commitment, is the one from which we should develop our criterion for the commitments of a

This would suggest that unless we can decide which criterion for what exists is correct, we are stuck with a neutral position towards criteria for the commitments of a discourse.

To recap: we started with the assumption that science can only tell us what there is if two questions are answered first. One, it needs to be determined which scientific theories are true, and two, we have to decide which criterion for the commitments of a theory should be used to read the ontological commitments off from scientific theories.

With regard to **question 1**, my view is that insofar as there is a clear conflict between what scientists say and what philosophers say about which theories are true, the

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theory. But in point of fact, I seriously doubt that an examination of the English language is going to reveal that one such word or phrase is always intended to be ontologically committing. On the other hand, while this project provides some pointers that would indicate that I'm right about this (see, in particular, II.4, where I discuss Varzi's point that the grammatical form of many ordinary English existence statements is "full of ontological traps", as he'd put it), I cannot claim to have actually established this, because this would require a more detailed examination of the English language than I am able to undertake here. However, *even if* we could show that there is one and only one particular way in which ordinary English speakers consistently express their ontological commitments, it is still an open question whether or not that way of expressing their ontological commitments is actually correct. Whether or not it is correct, it seems

strategy of answering it that is most in line with letting science determine what there is, is to simply adhere to the arguments that are offered by scientists, and not the arguments offered by philosophers.

With regard to **question 2**, the only strategies of answering it that seem to be available are strategies that rely on the prior adoption of an ontology. In particular, these strategies rely on the prior adoption of a criterion for what exists. But one is not allowed to employ these strategies if one also wants science to play a role in determining which ontology is correct. For this reason, I would conclude that science alone does not tell us what there is.

Rather, what I think we need to do first, is look at the philosophical arguments that are available to help us adjudicate between the *criteria for what exists* that are on offer. The next chapter is devoted in its entirety to an examination of the arguments that might be available to suit this task.

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to me, would in fact depend on what exists, and not on our verbal practices.

Chapter VIII. On the Irresolubility of Ontological Disputes

1. Introduction

We will now look at the philosophical arguments available that imply that a particular criterion for what exists is correct. In this chapter, I try to show that these arguments fail. Of course the list of arguments I discuss here is not exhaustive. However, once we see just *how* the arguments I discuss here fail, it should become clear that we are licensed to draw some more general conclusions (I spell these out in section 3), conclusions that also apply to arguments outside the purview of this project.

So, generally speaking, our goal here is to find out whether or not there are any philosophical resources available to settle which, if any, criterion for what exists is correct. That means we are assuming, first of all, that only one family of extensionally equivalent criteria *can* be correct. What supports this assumption is that a criterion for what exists is here understood as a set of necessary *and* sufficient conditions for what exists.

Also, let me once more remind the reader that the said criteria are *metaphysical*, and not epistemological, criteria. They are not criteria for what entities we believe exist, but criteria for what entities do exist.

This assumes, of course, that there *are* some entities that exist independently of our thoughts and beliefs about them.

A look at the literature discussed in chapters III-VI reveals several arguments that support one or another criterion for what exists. In this chapter, we will look at some of these in greater detail. In an effort to broaden the scope of this investigation, I will also discuss some arguments that I have not surveyed in previous chapters. Here, then, is the list of arguments I want to discuss:

(A) Arguments Utilizing Quine's Criterion

(B) Epistemic Arguments

(C) An Inductive Argument

(D) Metaphysical Arguments

(A), **(B)** and **(D)** each refer to a group of arguments that I think belong to the same type. **(C)** just refers to one particular argument.

Let me start by saying a bit more about the assumptions and general ideas on which my criticisms rest. My attack on arguments that utilize Quine's criterion rely on the assumption that we must adopt a neutral position about which criterion for the commitments of a theory is correct. In chapter II, I have tried in to motivate this position, and the arguments I presented in chapter VII

support it further. If I am right, then the arguments in chapter VII show that a criterion for what exists has to be adopted before this neutrality can be given up.

The epistemic arguments I consider in **(B)** will depend on being able to structure counter-examples to those arguments. The inductive argument in **(C)**, or Colyvan's version of it, which is the only version of it that I discuss, relies on an analogy to criteria for natural kind terms and how these are established. I will try to show that this analogy is not successful. Lastly, in **(D)**, I briefly consider some metaphysical arguments for the correctness of one or other criterion for what exists. The main argument in that section, is that arguments from metaphysical claims rely on the move I argue against in **(A)**.

2. The Arguments

(A) Arguments Utilizing Quine's Criterion

In this section, I want to consider some arguments that rely on the correctness of Quine's criterion for the commitments of a theory. The arguments we will look at are often used to help motivate the view that the objects of mathematics exist. I think, in fact, that arguments of

this type are not at all uncommon in the literature. Furthermore, some of the premises in these arguments imply the correctness of a criterion for what exists, though this criterion will only supply a sufficient condition for what exists, and not a necessary one. I must also stress that the proponents of these arguments do not actually discuss this sufficient condition.

In order to get to the sufficient condition for what exists and the argument for it, we must start by examining two examples of the general types of arguments that I have in mind.

First example: In VI.3, we saw that Resnik believes there is a prima facie case for mathematical realism, which he derives from the first horn of Benacerraf's dilemma. Let us now look at an expanded version of the quote I discussed in chapter VI:

> [T]he apparent grammatical and logical forms of mathematical existence-claims are the same as those of more mundane existence claims. This can be brought out dramatically by considering a sentence which mixes these claims. On a straightforward reading the sentence
>
> The solutions to some of the problems involved numbers exceeding the capacities of some pocket calculators

> contains two existential claims: first, that numbers exist which solve certain problems, and second, that there are pocket calculators that cannot handle these numbers. Consequently, anyone who denies the straightforward reading of the claim about numbers owes us an account of the type of claim, if any, it does make. But no uncontroversial account is at hand...[211]

Resnik takes the fact that mathematical and non-mathematical existence statements have the same logical and grammatical form as his starting point for his view that mathematical entities exist.[212] His argument then goes like this: since the grammar and logical form of the statements of mathematics is the same as that of other (e.g. empirical) statements, we should also read them the same straightforward way: just as empirical existence statements are taken to assert the existence of empirical objects, mathematical existence statements should be taken to assert

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[211] Resnik, 1997, p. 41. On the next page (p. 42), Resnik continues thus: "Not only do we presume that mathematicians mean what they say ... we also presume that their pronouncements result from an earnest and well-disciplined search for the truth ... None of them seem to think that mathematics is just make-believe."

[212] As we've seen, this is not the only argument Resnik makes in support of mathematical realism, however.

the existence of mathematical objects. Furthermore, if a philosopher believes that mathematical existence statements should not be read in this straightforward way, then that philosopher owes us an account of how such statements should be read instead. Finally, we should add that the application of Quine's criterion for the commitments of a theory preserves this reading of existence statements. (While this last bit is not part of the quote above, we saw in chapter VI that this is the criterion for the commitments of a theory that Resnik endorses.)[213]

Second example: In his 1998, Katz motivates realism about abstract objects in the following way:

> Mathematics, logic, and linguistics tell us that statements like (1)-(4) are true:
>
> (1) There is a perfect number less than seven.
>
> (2) There are propositions that imply everything.
>
> (3) There are English sentences with no phonologically realized subject.

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[213] Another argument that proceeds from the structure of language to the existence of objects can be found in Hale (1987, p. 11). Hale argues for the existence of numbers, and abstract objects in general, on what he calls "Fregean grounds". He says that "(1) If a range of expressions function as singular terms in true statements, then there are objects denoted by expressions belonging to that range, (2) Numbers… do so function in many true statements, …, hence (3) There exist objects denoted by those numerical expressions (i.e. there are numbers)".

(4) There are infinitely many numbers (propositions, sentences).

In virtue of what mathematics, logic, and linguistics tell us, philosophers are committed to the existence of numbers, propositions, and sentences. Philosophers who accept the formal scientist's claims about numbers, propositions, or sentences, are required to acknowledge that there are such objects. But that acknowledgement does not require taking a stand on the issue of what kind of things numbers, propositions, and sentences are. Thus, it is mistaken to think that the ontology of mathematics is an issue at can be settled on the basis of a principle of ontological commitment. We may concede for the sake of the argument that, as Quine (1961a, 13-14) says, "a theory is committed to those and only those entities to which the bound variables of the theory must be capable of referring in order for the affirmations made in the theory to be true." But this concession is not enough to establish that "[c]lassical mathematics… is up to its neck in commitments to an ontology of abstract objects." The principle of ontological commitment may show that mathematics is up to its neck in numbers, but it can't show that the

> numbers we are up to our necks in are abstract objects. This requires a philosophical argument to show that numbers are abstract rather than concrete objects.[214]

According to Katz, the grounds mathematicians offer for the truth of mathematical statements are a priori: they consist in providing mathematical proof.

As I see it, the argument Katz gives in the quote relies on the idea that if a statement of the form "there is…" is true, then the objects the statement says exist, do exist. (He certainly does rely on this idea for the statements that he in fact provides.) As he says, we are told that such statements are true (according to mathematics, logic or linguistics) and that if we accept that they are, then we are "required to acknowledge that there are such objects". Katz's acceptance of Quine's criterion for the commitments of a theory in the latter part of the quote further supports that point.[215]

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[214] Katz, 1998, pp. 5,6 (incidentally, the 1961 article Katz refers to is his 1948, "On What There is"). In this book, Katz then proceeds to argue that numbers, propositions, etc, are indeed abstract objects, and that we can also know about them.

[215] In the quote, it seems as though Katz only concedes Quine's criterion for the sake of the argument he offers. But as I understand this passage, the qualifier "for the sake of the argument" is added only because he does not

Working off from the quotes above, one possible way of stating the argument offered by Resnik and Katz is this:

1. Some mathematical statements of the form "there are **S**s" are true. (Premise)

2. Statements of the form "there are **S**s" are ontologically committing, and therefore, the objects that *true* statements of the form "there are **S**s" are committed to, exist. (Premise)

3. Some mathematical objects exist.[216] (Conclusion)

Though I've just stated the argument as being only about the statements of mathematics, I think that it actually applies to non-mathematical statements as well. The argument Resnik makes relies on the idea that other (non-mathematical) statements of the form "there are **S**s"

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think that acceptance of Quine's criterion commits one to numbers being *abstract objects*. As he says at the end of the quote, it "requires philosophical argument to show that numbers are abstract." Moreover, when Katz says that "it is mistaken to think that the ontology of mathematics is an issue that can be settled on the basis of a principle of ontological commitment", all he means is that it is mistaken that a principle of ontological commitment settles what sorts of objects the objects of mathematics are (as in, whether they are abstract or concrete), but not whether or not they exist.

are ontologically committing. For, in the quote, he says "the apparent grammatical and logical forms of mathematical existence-claims are the same as those of more mundane existence claims." Katz, in the work I quoted from, is providing examples not just from mathematics, but also from logic and linguistics.

That said, however, if this is the correct form of the argument, then the argument isn't going to work. In chapter II, we established that we cannot assume that ordinary speakers of English always intend "there is…" statements to be ontologically committing. Therefore, odd as it may sound at first blush, "there is an **S**", cannot always be taken to be ontologically committed to **S**s. In II.4, we looked at a number of such statements ("There is a hole in this piece of cheese", "There is a difference in age between John and Tom", etc.) from Varzi's 2002. According to Varzi, these are statements that we can truthfully make, yet, at least in Varzi's view, they simply have a misleading grammatical form. That is, while the grammatical form of these statements implies the existence of certain entities (holes, age differences), not everyone thinks that such entities are real, and that seems right.

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[216] Lewis (1973, p. 84) argues that there are possible worlds for similar reasons.

Certainly, not all philosophers think that such entities are real, even if they are willing to truthfully utter sentences of that form. But in addition, and more importantly (to my mind, anyway), *ordinary speakers of English don't*, even if they are willing to truthfully utter sentences of that form.[217]

If this is the case, then the burden of proof for the claim that the particular statements Resnik and Katz offer *must* be read as ontologically committing (that is, that they do not belong to the set of statements that we in fact don't think are ontologically committing!) is on Resnik and Katz. They seem to assume that if a statement says that there are **S**s, and the statement is true, then there are **S**s. But if ordinary speakers of English are not willing to grant that this is always so, then Resnik and Katz will have to provide us with reasons for why the particular statements *they* offer *do* fall within the set of statements that *are* ontologically committing. And they have not done so.

For this reason, I don't think that this is the form the argument offered by Resnik and Katz should take. But perhaps we can provide an argument that avoids reliance on

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[217] And as I pointed out in II.4, Quine also thinks that "there is" statements in ordinary English should not always

the idea that ordinary English "there is…" statements must be read as ontologically committing. The following argument, I think, would do that job (though I should emphasize that I do not endorse the argument, as will become clear below):

1. If Quine's criterion for the commitments of a theory is correct, then (whenever a consistent first order statement implies (Ex)**S**x and (Ex)**S**x is true, then **S**s exist.)

(Premise)

2. Quine's criterion for the commitments of a theory is correct. (Premise)

3. Therefore, (whenever a consistent first order statement implies (Ex)**S**x and (Ex)**S**x is true,) then **S**s exist.

(MP from 1. and 2.)

4. Some consistent first order statements of the form (Ex)**S**x are true. (Premise)

5. Some consistent first order statements imply (Ex)**S**x.

(Premise)

6. Some **S**s exist. (Conclusion, follows from 3.,4. and 5.)

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be taken as ontologically committing.

Lines 1 and 2 of this argument thus provides justification for a criterion for what exists, albeit only a partial one. This criterion is given in **line 3**:

Whenever a consistent first order statement implies (Ex)**S**x and (Ex)**S**x is true, then Ss exist.

This criterion is only a partial one because it is only a sufficient condition for what exists. The reason for this is that as a necessary *and* sufficient condition, it would clearly be false, for that would suggest that what exists is dependent upon there being consistent first order statements of the form (Ex)**S**x.

The remainder of this section will concentrate on the argument for the sufficient condition for what exists represented by **line 1** to **line 3**. **Line 2** says that Quine's criterion for the commitments of a theory is correct, and therefore, I shall henceforth call it "the argument from Quine's criterion."

Before I move on to a critical evaluation of this argument, two comments are in order. First comment: it will be objected that this is not the argument that Resnik or Katz had in mind, and for two reasons. One, neither Resnik nor Katz actually offer this sufficient condition

for what exists in their works. This point I grant. Second, the sample statements they provide are not statements that are regimented in first order form. This point is true as well but we've also seen that both Resnik and Katz *do* accept Quine's criterion.

Second comment: **line 3** says that whenever a consistent first order statement implies (Ex)**S**x and (Ex)**S**x *is true*, then **S**s exist. This should *not* be misunderstood as implying that Quine's criterion for the commitments of a theory cannot be applied to false statements. Quite the contrary. As I have said before (II.4), Quine's criterion applies to a theory, *regardless* of the truth value of that theory.

Let us now look at the argument more carefully. As I see it, there are two problems with it. The first problem is that **line 1** already assumes a sufficient condition for what exists because it is logically equivalent to the following:

If (Quine's criterion for the commitments of a theory is correct **and** a first order statement implies (Ex)**S**x and (Ex)**S**x is true), **then** Ss exist.

So the argument has as a conclusion a sufficient condition for what exists, *but* it assumes *another* sufficient condition as a premise. This is clearly problematic. The question posed in this project is whether or not criteria for what exists can be justified in the first place. So we can hardly permit arguments that use them as premises.

The second problem is that in my view, **line 2** it is a premise that we are not entitled to. As I argued in II.4, Quine's criterion is not the only criterion for the commitments of a theory that's on the market. There are a number of such criteria available to us. In fact, the predicate approach to ontological commitment supplies us with an entire family of alternatives to Quine's way of reading the ontological commitments off a theory. And, we cannot simply *assume* that one such criterion for the commitments of a theory is correct. As I said in II.4, a more conservative attitude toward the different criteria for the commitments of a theory is one of neutrality.

But not only are we not justified in assuming that one particular criterion for the commitments of a theory is correct, in order to justify *which* criterion for what a theory commits us to *is* in fact correct, we need to have a criterion for what exists already in place. For only a criterion for what exists provides us with the

philosophical grounds on the basis of which we can show that a particular criterion for the commitments of a theory is the right one. This, at any rate, is what I argued in VII.2, and this is going to create a problem for the argument from Quine's criterion.

To start with, we should note that the predicate approach to ontological commitment provides us with the following response to the argument from Quine's criterion: we could grant that some first order statements of the form (Ex)**S**x are true. *But*, we might say, let's not use Quine's criterion for the commitments of a theory to read the ontological commitments off from statements, but resort to a version of the predicate approach of ontological commitment instead.[218] To use an example that is very familiar by now, we could use the predicate "is causally efficacious", or **C**, for short, to read the ontological commitments off from theories. Thus, we would only take first order statements of the form (Ex)(**S**x & **C**x) to be committed to **S**s, but not statements of the form (Ex)**S**x. In particular, on this approach, statements of the form (Ex)**N**x, where **N**x stands for "x is a number", would not be ontologically committing.

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[218] A version that is not identical to Quine's criterion, that is.

But of course, if we cannot assume that any particular criterion for the commitments of a theory is correct unless we have a criterion for what exists already in place, we also cannot assume that the predicate "is causally efficacious" has ontological force. So the *real* lesson here is simply that from the fact that some first order statements of the form (Ex)**S**x are true, we are not entitled to draw *any* conclusions with regard to what objects are real. As we have seen, several criteria the commitments of a theory are available, and hence, the ontological commitments of a theory can be altered depending on which of these is applied to that theory. Some such criteria will commit a theory to numbers, other such criteria will not. **Line 2** of the argument from Quine's criterion cannot be sustained.

The upshot: the argument from Quine's criterion falls short of its intended goal. For, unless we know *which* criterion for the commitments of a theory is correct, we are not in a position to say *which* entities a theory is committed to, and thus, we don't know *which* entities exist according to such an argument.

(B) Epistemic Arguments

In chapter VI, we saw that Field uses a restatement of Benacerraf's challenge to motivate his nominalism about numbers. There, I provided the following quote from Field's 1989:

> …Benacerraf's challenge…is to provide an account of the mechanisms that explain how our beliefs about these remote entities [mathematical entities] can so well reflect the facts about them. The idea is that *if it appears in principle impossible to explain this*, then that tends to *undermine* the belief in mathematical entities, *despite* whatever reason we might have for believing in them.[219]

To review, Field's argument is this: if we can't tell a story that shows *why* what we believe about mathematical entities is actually *true* of those entities, then that undercuts our belief in the existence of those entities.

Colyvan examines a similar argument in his 2001:[220] "if there were causally idle entities, we would have no reason to believe in them, since their causal idleness would ensure that they didn't causally interact with us."[221] According to Colyvan, this argument is used to show that

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[219] Field, 1989, p. 26.

[220] Colyvan does not endorse the argument, however.

"an entity is to be counted as real if and only if it is capable of participating in causal processes."[222] So the reason, as Colyvan has it, for not counting an entity as real if it isn't "capable of participating in causal processes" is because "their causal idleness would ensure they didn't causally interact with us." Colyvan calls this sort of argument an "epistemic argument". I will follow his usage here and call both Colyvan's and Field's arguments "epistemic arguments".

Now, it is clear that both Field and Colyvan only use these arguments to motivate epistemic conclusions, that is, conclusions about what entities we should or should not believe in. The quote from Field says that our *belief* in mathematical entities is undermined, and the Colyvan quote says that we should not *count* causally idle entities as real.

What we are interested in, on the other hand, are metaphysical conclusions, conclusions, that is, about what entities exist and what entities don't. So the question arises whether or not it is possible to arrive at any metaphysical conclusions from the arguments presented by

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[221] Colyvan, 2001, p. 42.

[222] Colyvan, 2001, p. 40.

Field and Colyvan. Could we, for instance, use epistemic arguments of this sort to support the causal criterion for what exists?

Well, if we were to use epistemic arguments in this way, then we would need to show that - in Colyvan's terminology - if we should not *count* an entity as real, then it also isn't real.[223] But I think it is relatively clear that *that* isn't something we *can* show. My objection to such a claim is, in a nutshell, that an entity may be real even though *we* do not have any reason to count it as real.

This objection can be developed in several ways. The first way is due to Colyvan.[224] He says that there are some entities that we do not have any epistemic access to, such as stars and planets outside our light cone, and so we do not have any reason to count them among the entities that exist. And yet, such entities might be real.[225]

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[223] I'm not using Field's terminology here because Field's claim is actually weaker than the one Colyvan examines. In the quote, he says only that belief in mathematical entities is *undermined*, not that we should not believe in mathematical entities. And while I do think that Field's nominalist program provides evidence that he does not believe in mathematical entities, he does not say so in the quote.

[224] Colyvan, 2001, p. 42.

[225] See Colyvan 2001, p. 42.

The same point can be made in terms of a different example. At one time, we did not have any epistemic access to electrons (they were too small to be detected with our instruments), so we did not have any reason for counting them as real. Nonetheless, if electrons do exist, then they also existed at a time at which we did not have access to them, and therefore they existed at a time at which we did not count them as real.

As we can see, this way of developing the objection is in terms of entities that are not thought to be causally idle. However, the objection can also be developed in terms of examples of entities that don't have causal powers. It can be phrased in terms of entities that we cannot have any access to because we've defined them in such a way that any access is impossible. I have in mind the objects of mathematics. According to how we had it in I.3, mathematical objects, if they exist, are not in space, not in time, and they do not have causal powers. So there is no way that we can interact with such objects because of the nature such objects would have to have if they did exist (if they existed, they would not be in space, or in time, and they would not have causal powers). Therefore,

even though we don't have reason to count mathematical objects as real, mathematical objects might still exist.[226]

This point can be generalized, for numbers are not the only objects that (if they exist) are not in space, not in time, and don't have causal powers. In fact, all abstract objects are thought of in this way. The examples I listed in the introduction were sets, classes, propositions (not everyone holds that propositions are abstract objects, though), meanings, intensions, properties and relations (as I said in the introduction, on some views, some of these may also not be included in our list). Thus, we cannot exclude the possibility that any of these exist, even though we cannot have access to them.

The reader will have noticed that in this section, I've only concentrated on arguments that move from assumptions about what entities we should not count as real to conclusions about what entities do not exist. But what about arguments that start with assumptions about what entities we *should* count as real, and that move to a

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[226] Perhaps it could be objected that we can have access to the objects of mathematics through something like mathematical intuition. But that only pushes the problem one step further back. For we are now entitled to ask how we know that intuition provides access, or that the objects we grasp through intuition are indeed *the objects of mathematics*, that is, how we know that we have interacted with *the objects of mathematics* in our act of intuiting.

conclusion about what entities *are* real? Are arguments of that kind more successful? I would think that they would be. On the other hand, it has to be pointed out that of course we could have very good reasons for counting an entity as real and still turn out to be wrong. But skeptical worries of this sort aside, the interesting question now becomes on what *reasons* we have for counting certain entities as real. But the examination of such reasons is the job of this entire chapter, and not this section alone.

(C) An Inductive Argument

The type of argument I want to explore next is of a somewhat different nature. As a first approximation, this argument says that we should start with a set of entities whose existence is simply uncontroversial, and then generalize to the entities that are outside of that set.

An argument of this sort is described and later criticized by Colyvan (2001):

> All the things that we intuitively think of as real are the sorts of things that participate in causal processes …, whereas those that we intuitively think of as unreal do not participate in such processes. Thus motivated, the Eleatic principle is an inductive

> hypothesis about the way the world is. We look at the things in the world that are uncontroversially real, such as tables and chairs, and notice that they are all causally active. Then, by induction, we conclude that all real entities are causally active.[227]

"The Eleatic Principle" is another name for the causal criterion for what exists. So, according to the argument Colyvan presents here, an entity is real if and only if it has causal powers. Colyvan calls this argument "the inductive argument" and I'm again happy to stick with his suggestion.

I think that the way to understand the inductive argument is as implicitly relying on an analogy to criteria for natural kind terms such as "silver" or "cat". That is, we must see the inductive argument as trying to justify the correctness of a criterion for what exists in much the same way criteria for natural kind terms are grounded.

However, the problem with the inductive argument is that there are some fundamental differences between criteria for natural kind terms and criteria for what exists. And it is precisely those differences that permit an inductive argument of this sort to be successful in the

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[227] Colyvan, 2001, p. 41.

case of criteria for natural kind terms, but not in the case of criteria for what exists.

We start, then, by having a look at criteria for natural kind terms and how these are established. First, some preliminary remarks: while what I say here loosely relies on Kripke's (1972) and Putnam's (1975) discussion of natural kinds, I should make it clear that neither philosopher uses the term "criterion" in the way in which I do here. The examples I shall discuss are mine as well. Finally, I will not be offering anything resembling a full-blown theory of criteria for natural kind terms. What I present is a mere sketch, just sufficient for us to explore the analogy to criteria for what exists.

Let's first look at the natural kind silver. I think it's fair to say that our current criterion for something's being silver is that it has atomic number 47. So X is silver if and only if X has atomic number 47.[228] How might that criterion have been established?

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[228] I am not suggesting that this criterion holds in all possible worlds. My discussion of criteria for what exists focuses on the actual world only. For the purposes of this analogy, a discussion of possible worlds will complicate matters unnecessarily. We assume, therefore, that X is silver if and only if it has atomic number 47 holds in the actual world, and as far as possible worlds are concerned, all bets are off.

The story could have gone something like this: at one point, we started out with a sample, or paradigmatic instance,[229] of stuff that fit a certain physical description (i.e. a sample of stuff that is shiny, silvery, and metallic), and named that stuff "silver". By examining that sample, and by contrasting it with samples of stuff that do *not* fall under that description,[230] we eventually discovered a property that seemed to capture the stuff we call "silver" uniquely. Presumably, in the case of silver, it's the property of having 47 protons in its nucleus. So we decided to use that description as our criterion for silver. Of course, if, in the future, we find out that we were wrong, we will revise our criterion.

So, our sample provides us with certain empirical data that we can use to support, as well as revise, the criterion we base on that sample. Our criterion is thus defeasible by empirical investigation. That is, we might turn out to be wrong about the property that captures silver uniquely (e.g. it doesn't have atomic number 47), or we might turn out to be wrong about some of its surface

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[229] The latter term is borrowed from Kripke, 1972, p. 122.

[230] This point is made by Devitt, 1996, p. 72.

properties (e.g. it isn't always shiny). In either case, we might revise our criterion for silver.[231]

Secondly, our criterion for silver allows us to generalize to items outside of our sample. That is, the idea is not just that what's *in our sample* is silver, but also that *whatever falls under the criterion of "silver" is silver.* "Silver", given our present criterion, applies to everything that has atomic number 47.[232]

Alternatively, we could say that a criterion for what it is for something to be a cat is that it has a certain genetic makeup. Again, a possible way that criterion might have been established started with a sample, or a paradigmatic instance, of animals we call "cat", as well as a sample of animals that we don't call "cat". Presumably,

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[231] See also Devitt on this (1996, p. 73). As Devitt points out, "[w]e may even conclude that *none* of the things identified as F's are F's" (ibid.).

[232] Putnam (1975) also uses the term "criterion", but he employs it to mark out the "central features" of a "stereotype" ("a standardized description of features of the [natural] kind that are typical, or 'normal', or at any rate stereotypical" - p. 235 in Harnish). According to Putnam, "the two ways of telling someone what one means by a natural-kind term" (p. 234) are ostensive definition (pp. 230, 234) and description (pp. 234/235). The ostensive definition of a kind is defeasible (in the way described above - p. 230). But the descriptive one is also (this point is made indirectly on p. 237). Though my use of the term "criterion" is not exactly the same, the parallel is clear.

the criterion we would have arrived at by investigating those samples (at least nowadays) would be the one above, namely that something is a cat if and only if it has a certain genetic makeup. Again, our criterion is defeasible by empirical investigation. It might be that in the future, an empirical investigation of cats will reveal that cats don't have all of the properties we thought they do, in which case we will revise the criterion accordingly.[233] Also, our criterion lets us generalize to items outside of the original sample.

These examples of how criteria for natural kind terms are established are of course highly idealized and artificial. But I am not trying to give a historical account here. Rather, I think that these somewhat encapsulated stories capture the thought process of how such criteria are arrived at.

We can summarize this thought process in the following three steps:

> **Step 1:** Picking a sample of stuff that fits a certain description (and naming it), as well as a sample of stuff that does not fit the description.

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[233] Alternatively, we might decide that some of the animals we have called "cat" aren't cats after all.

Step 2: Investigating the sample for its properties (as well as contrasting it with the sample of stuff that does not fit the description) and developing a criterion based on those properties.

Step 3: Generalizing to things outside the sample.

We now return to the inductive argument. The inductive argument that Colyvan discusses can be described by the same three logical steps. The argument starts with a sample, or paradigmatic case, of things that, in Colyvan's words "we intuitively think of as real" and a sample, or paradigmatic case, of things that "we intuitively think of as unreal" (see quote above). Alternatively put, we start with a set of things that we think fall under the term "real" and a set of things we think don't. This would fit **step 1** above.

Next, a look at these samples, or paradigmatic instances, reveals that the things that we think of as intuitively real all seem to have one property in common: they are all causally active. Furthermore, the things that we don't think of as intuitively real are not causally active. According to the quote by Colyvan I provided above, "we look at the things in the world that are

uncontroversially real, such as tables and chairs, and notice that they are all causally active." Furthermore, "those [things] that we intuitively think of as unreal do not participate in such [causal] processes."[234] Thus, based on what's in our samples, or based on paradigmatic instances, our criterion for what exists should read: **S** exists if and only if **S** has causal powers. That would be **step 2** above. The inductive step is **step 3** above. We generalize from our paradigmatic instances to everything that is real: "by induction, we conclude that all real entities are causally active".

In my view, there are two problems with this sort of argument. The first problem is with **step 1**, the second problem with **step 3**. We begin with **step 1**. The problem I see with this step is that there really is no set of entities the existence of which is free of controversy, or a set of things that are uncontroversially real. Therefore, we don't actually have a sample we can start with. We don't have such a sample because notoriously, *we cannot agree on what should be in it*. Without such a

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[234] A careful look at the entire quote by Colyvan suggests that he treats "intuitively real" and "uncontroversially real" as synonymous. I must confess that I'm a bit worried about this, because I think "uncontroversially real" is stronger than "intuitively real".

sample, however, the inductive argument cannot get off the ground.

Let me give some examples to illustrate this controversy. We can start by returning to Colyvan. As Colyvan himself notes,

> such an inductive argument is going to depend on what our set of uncontroversially real entities is taken to be. For instance, if we decide to be fairly cautious about selecting the members of this set, and only admit medium-sized solid objects, we might conclude that all real entities are coloured.[235]

For Colyvan, then, being cautious could mean excluding theoretical entities. This may be because, as the realism debate in the philosophy of science can attest to, not everyone accepts that theoretical entities are uncontroversially real.

But caution could also steer us in the opposite direction. We might, for instance, think that medium sized solid objects should be *excluded* from our list of uncontroversially real entities. This direction could be motivated by eliminativist tendencies, or - perhaps more aptly - by eliminativist hopes. If someone believed, for

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[235] Colyvan, 2001, p. 42.

example, that at some point, all references to mid-sized objects will be eliminated and replaced by talk about subatomic particles, then it may not be correct to include tables and chairs in a sample of what's *uncontroversially* real. (Though we may find it strange to talk in terms of subatomic particles only, Eddington was convinced that the time will come when our language will actually reflect such eliminativism.)[236]

This exercise can be repeated with other examples. Some philosophers, such as Resnik and Katz, seem to suggest that numbers should be included in our sample. Now, I am not sure whether they believe that numbers are *uncontroversially* real. On the other hand, we do know that Resnik thinks that there is a *prima facie* case for believing in numbers (see chapter VI, and section **(A)** of this chapter). It would not be unreasonable to interpret this to mean that he thinks the burden of proof is on the side of those who claim that numbers are *not* real. The quotes we looked at by Field, on the other hand, suggest just the opposite. He seems to think that we have at least prima facie reason not to believe in numbers. It would therefore stand to reason that numbers should *not* be considered part of our sample.

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[236] See Eddington (1929), in Levenson and Westphal, p. 149.

At this point we should ask ourselves what can be used as a source for the claim that certain entities are uncontroversially real. I see two possibilities here. The first possibility is that we utilize our philosophical intuitions about what entities must be real. This is, in fact, what Colyvan's quote suggests.

But I believe that there's a danger to regarding our intuitions about what exists as philosophical bedrock. First of all, we have to acknowledge that our philosophical intuitions regarding what entities are real, conflict. For example, some have the intuition that there are numbers, others have the intuition that there aren't. So whose intuitions should we rely on, and whose intuitions should we reject? Secondly, I should think that our intuitions about what exists might very well be mistaken.

And lastly, it seems that at least sometimes, ontological intuitions are based on language, and not on the way the world is. For example, one possible explanation for the intuition that there are numbers is that numbers function as the objects in some of our "there is…" statements. Take an ordinary English statement like "there are at least three numbers greater than three". This statement clearly makes an existence claim. (Quine's criterion for the commitments of a theory preserves this

reading - but even without the use of Quine's criterion, it is clear that this statement certainly *says* that some numbers exist). So, why not take it as intuitively self-evident that there are numbers greater than three? Unfortunately, we've seen that we cannot simply grant that our ordinary use of "there is" always succeeds in making existence claims (see section **(A)**). So we cannot take the fact that numbers function as (grammatical) objects in some of our "there is" statements as obviously showing that numbers exist.[237]

The second possible way to ground the claim that certain entities are uncontroversially real would be to provide philosophical arguments of the sorts we are examining in this project. In that case, however, it is these arguments that must be evaluated for their soundness, before we can decide if they allow us to include an entity in our sample, or exclude an entity from it. Also, if we hold that an argument is required to justify the claim that an entity is, or is not, uncontroversially real, then

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[237] In his 2003, section 2., Azzouni presents a number of other ways in which we use "there is…" statements without thereby taking ourselves to be committed to the objects these are about. Church (1958), although he supports Quine's criterion, also provides some counterexamples. Finally, as I said in II.4, this is one of the reasons Varzi (2002) has for suggesting that metaphysicians don't

aren't we, in fact, conceding that there is no set of uncontroversially real entities? For, if we take "uncontroversial" to mean "no controversy!", then no such argument should be required.

But finally, even *if* we granted that such a set of uncontroversially real entities could be arrived at (however that would be done), I don't think that the inductive argument is going to work. The reason for this lies with how to justify the induction in **step 3**, however. We turn to this next.

We said above that a *sample* of a natural kind is a *paradigmatic instance* of that kind. This means that the property, or set of properties that capture the kind uniquely, are instantiated by that sample. And that is precisely what justifies a generalization from entities in the sample to entities outside of the sample. The fact that the entities inside the sample are paradigmatic instances of the kind in question, or that they possess the properties that capture the kind uniquely, is what entitles us to say that not only what is in our sample falls under the natural kind, but that *all the things which possess these properties* fall under the natural kind.

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simply resort to ordinary English to find out what there is.

But the question now arises whether or not, even if we *had* arrived at a set of uncontroversially real entities, this would entitle us to make an analogous claim with regard to *that* set, that is, whether or not it would entitle us to say *of the members of the set of uncontroversially real entities* that they constitute a *paradigmatic instance* of what is real. That is, would we be justified in saying that the members of our sample instantiate the property (or properties) that *uniquely* capture the property (or properties) of everything that belongs to the kind "real"?

If the answer to that question is "no", then the inductive argument doesn't work. **Step 3** - the induction step - rests not just on there being a set of uncontroversially real entities, but also on the assumption that the members of this set constitute a *paradigm case* of what is real, that is, it relies on the assumption that what is in our sample possesses the property (or properties) that *uniquely* capture the property (or properties) of everything that is real.[238]

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[238] We might also ask ourselves whether, if we had arrived at a set of entities that are uncontroversially unreal, we would be allowed to conclude that this set provides a paradigmatic instance of what is unreal. However, I'm not at all sure what having a sample of uncontroversially unreal entities even means. How can we have a sample of

To use the example Colyvan gives, what we are really asking is this: even if we grant the assumption that the entities we regard as uncontroversially real (the entities in our sample) have causal powers, what justifies us to conclude from this that having causal powers is the property that *uniquely* captures everything that is real? What justifies us in saying that having causal powers is what's *paradigmatic* of what is real?

As I see it, some *further* argument is needed to establish that point. We need an argument to the effect that the property of having causal powers is a property that *uniquely* captures everything that is real. Alternatively put, what we need is an argument to the effect that our sample really is a *paradigmatic* sample. *Only then* are we allowed to conclude that everything that is real has causal powers. But such an argument, so far as I can see, has not been supplied here. Certainly, it is not part of the inductive argument Colyvan discusses.

I think it is therefore fair to conclude than an argument for a criterion for what exists that relies on an

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things that don't exist? It seems that at best, what we could have is a set of non-referring terms. Secondly, can a set of unreal entities have properties (I'm not here providing an argument that it can't, but it is an interesting question, the answer to which may not be obvious)?

inductive step can be successful only if, one, a set of uncontroversially real entities from which to generalize can be arrived at (something which I don't grant), and two, if the case can be made that this sample constitutes a paradigmatic instance of what is real (for which additional argument is needed).

(D) Metaphysical Arguments

From the foregoing, a philosopher might conclude that it is better to argue for a criterion for what exists by starting with a metaphysical theory about the world rather than starting with a set of entities he thinks exist. That is, a philosopher might try to argue that certain metaphysical truths, or truths about the actual nature of the world, directly imply the correctness of a particular criterion for what exists. His argument might be characterized like this: Theory T is true of the world, and theory T implies a particular criterion for what exists C. Therefore, criterion C is correct. I will call arguments of this sort "metaphysical arguments".

How should such arguments be filled in? Here's a possibility. Assume that materialism is true. One possible definition of materialism is this: the only things that are real are the things that have physical properties.

(I borrow this definition from Kim and Sosa, 1995.)[239] If that is the case, then materialism directly implies the following criterion for what exists: the only things that are real are things that have physical properties.[240]

Justifications for the assumption that materialism is true seem to me to fall into two categories. They could be a priori, by which I mean that reason alone tells us that the premise is true, or they could be empirical, which, I would think, nowadays means that we take justification to come, broadly speaking, from science.

I don't here have anything to say about possible priori justifications for the assumption that materialism (or this definitions of naturalism) is true. I take it that the philosophers I have discussed in this project would not find such an approach appealing. The more promising route seems to me to be a justification based on empirical grounds. The way I developed this possibility in VII.2, this means that we are reading the view that

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[239] Kim and Sosa, 1995, p. 391.

[240] Alternatively, one could assume that naturalism is true, and then define naturalism as the view that the only things that are real are those things that have natural properties (again, this is just one possible definition of "naturalism" and it, too is borrowed from Kim and Sosa, p. 343). Then it would follow from naturalism that the only things that exist are things that have natural properties.

materialism is true off from what our current theories of science say.

But in VII.2, I also argued that this way of proceeding requires a criterion for the commitments of a theory. This, to repeat, is because we need a tool for determining *which* of the entities scientific theories talk about are the entities that these theories are indeed committed to. And this tool is not available to us unless we have a criterion for what exists already in place, which, in turn is what the above argument is supposed to deliver. So we can't then rely on such a tool in order to argue for the correctness of one or other criterion for what exists.[241]

3. Conclusions

I will now briefly recap what I have claimed in this chapter. I have claimed that the arguments I surveyed here

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[241] Even if we do pretend that our scientific theories imply the existence of a set of entities, the question then arises how we then get from that set to everything that exists. That is, we have to assume that our current scientific theories are not yet complete, and so, more exists than what our theories say exists. That is, presumably, the set of entities that exist is larger than the set of entities that our current scientific theories imply as real. So, at best, we could arrive at a sufficient condition for what exists, but not at a necessary condition.

do not succeed in establishing that one or another criterion for what exists is correct. So, these arguments do not help us in settling ontological disputes.

Now, I have only discussed a few arguments here, and it is certainly possible that there are additional arguments one can marshal. Nevertheless, we can draw some more general conclusions, and these conclusions extend beyond the arguments that I have presented here.

Conclusion 1: If it can be sustained that we must adopt a neutral position towards criteria for what a theory commits us to, then any arguments for a criterion for what exists that rely on the correctness of one such criterion will fail. This is because, even if a particular theory were true, without the help of a criterion for determining the ontological commitments of that theory, we could not establish which - *if any* - of the entities that theory purports to refer to, exist. This distills the essence of what I have tried to argue in section **(A)**.

Conclusion 2: We can also say that an entity might exist even if we cannot have access to that entity. Thus, any argument for a criterion for what exists that relies on the claim that an entity does not exist because we cannot have access to that entity, fails **(B)**.

Conclusion 3: Furthermore, any argument for a criterion for what exists that depends on a induction from a set of entities that we think of as uncontroversially real to everything that is real, can work only if, one, a set of uncontroversially real entities can be arrived at (which I deny), and two, if an additional argument is given that shows that what is in our sample uniquely captures the property, or properties, of everything that is real **(C)**.

Conclusion 4: Lastly, basing an argument for a criterion for what exists on a metaphysical theory, in the way that I have sketched them out in **(D)**, seems also to require the correctness of a criterion for the commitments of a theory.

There is another suggestion I want to briefly entertain, however. Perhaps we could weaken the criterion for what exists in such a way as to circumvent some of these conclusions. One such possibility is this: we could demand that our criterion for what exists provide us only with *sufficient* conditions for what exists, and *not* with *necessary* conditions. Such a criterion would thus only provide conditions for which entities do exist. With regard to which entities don't exist, it would be silent.

Prima facie, a merely sufficient condition for what exists could not be used to argue *against* the existence of

certain entities. But perhaps a slightly weaker claim could still be made. If we only have a sufficient condition for what exists, then we might still be entitled to say that there is no reason to *believe* in the existence of entities to which that sufficient condition doesn't apply. This claim would thus be epistemic, not metaphysical. On the other hand, it is not clear what reasons, if pressed, we would offer *for* such a claim, since strictly speaking, a merely sufficient condition for what exists does not address the issue.

I am not going to argue whether or not we are entitled to make the epistemic claim that we don't have any reason to believe in the existence of entities to which that sufficient condition doesn't apply, but it seems to me that leaving the possibility *open* whether entities to which the sufficient condition does not apply actually do exist, would have at least one advantage: the arguments we would offer in favor of a merely sufficient condition for what exists would not have to be strong enough to rule out the possibility that an entity could exist although we cannot have access to it. As a result, arguments of type **(B)** - as well as **conclusion 2** - would not be applicable to a merely sufficient condition for what exists.

Let us then turn to the other three conclusions to see if they apply to merely sufficient conditions for what exists. Arguments for a merely sufficient condition for what exists would in effect be arguments that say that the entities to which that sufficient condition applies exist. But they would not have to be arguments that say that entities to which that sufficient condition does not apply do not exist.

Conclusion 1: Any arguments for a merely sufficient condition for what exists that rely on the correctness of a criterion for the commitments of a theory will still fail. This is especially evident since the criterion for what exists that we looked at in **(A)** *was* a merely sufficient condition, and not a necessary and sufficient condition. It ran: an entity exists if it falls within the range of the existential quantifier in a statement that is true.

Conclusion 3: Now, the inductive argument relied on the assumption that one can generalize from a set of uncontroversially real entities - a sample - to what exists in general. This means that we have to first come up with, and agree on, a sample of entities that are uncontroversially real, and I don't think we can. In addition, we have to show that the property we've selected as the sufficient condition is a property from which we can

generalize to real entities outside of that sample. This, I have tried to show, requires additional argument.

Conclusion 4: It seems clear that any argument that is based on a metaphysical theory cannot rely on the correctness of a criterion for the commitments of a theory, whether it is trying to show the correctness of a merely sufficient condition, or the correctness of a necessary and sufficient condition.

Now, this brief treatment of merely sufficient conditions for what exists is perhaps not enough to rule out the possibility that such a criterion could be argued for more successfully than a criterion that represents necessary and sufficient conditions for what exists. But then such was not the objective of this project. I mainly concentrated on criteria for necessary *and* sufficient conditions for what exists, and not just on sufficient conditions. So, while I have reservations that such a proposal is going to work on largely the same grounds on which I have reservations that we can argue for a necessary and sufficient condition for what exists, I do not profess to have conclusively established that fact.

Nor can I claim to have *conclusively* established that there is *no way* to argue for a necessary and sufficient condition for what exists. However, at the beginning of

this project, I used the following metaphor to get across the intuition I was working from: "A criterion for what exists is philosophical bedrock, and it isn't possible to slide any justification underneath it." In this final chapter, I would hope that I have given this intuition sufficient content to show that this claim is more than just an intuition. Should this bear out, then I would say that the prospects of coming up with an argument that does establish the correctness of one or other criterion for what exists are dim, indeed.

Bibliography

Armstrong, David. *Universals and Scientific Realism.* Cambridge, MA: Cambridge University Press, 1978.

---. *A Combinatorial Theory of Possibility.* Cambridge, MA: Cambridge University Press, 1989.

---. *A World of States of Affairs.* Cambridge, MA: Cambridge University Press, 1997.

---. "Difficult Cases in the Theory of *Truthmaking.*" *Monist* 83 (2000): 150-161.

---. *The General Theory of Truthmaking.* 2002.

Azzouni, Jody. "On 'On What There is'." *Pacific Philosophical Quarterly* 79 (1998): 1-18.

---. *Knowledge and Reference in Empirical Science.* New York, NY: Routledge, 2000.

---. *Deflating Existential Consequence: A Case for Nominalism.* New York, NY: Oxford University Press, 2004.

Ben-Menahem, Yemima. "The Inference to the Best Explanation." *Erkenntnis* 33 (1990): 319-344.

Boyd, Richard. "On the Current Status of Scientific Realism." *The Philosophy of Science*, edited by Richard Boyd, Richard, Philip Gasper and J.D. Trout, 195-222. Cambridge, MA: The MIT Press, 1991. First published in 1983.

Burgess, John P. and Rosen, Gideon. *A Subject With no Object: Strategies for Nominalistic Interpretation of Mathematics.* New York, NY: Oxford University Press, 1997.

Benacerraf, Paul. "What Numbers Could Not Be." *Philosophy of Mathematics: Selected Readings*, edited by Paul Benacerraf and Hilary Putnam, 272-294. Cambridge, MA: Cambridge University Press, 1994. First published in 1965.

---. "Mathematical Truth." *Philosophy of Mathematics:*

Selected Readings, edited by Paul Benacerraf and Hilary Putnam, 403-420. Cambridge, MA: Cambridge University Press, 1994. First published in 1973.

Campbell, Keith. "The Metaphysics of Abstract Particulars." *Properties*, edited by D. H. Mellor, and Alex Oliver, 125-139. New York, NY: Oxford University Press, New York, NY, 1997. First published in 1981.

---. "Selective Realism in the Philosophy of Physics." *The Monist* 77 (1994): 27-46.

Carnap, Rudolf. "Empiricism, Semantics and Ontology." *Philosophy of Mathematics: Selected Readings*, edited by Paul Benacerraf, and Hilary Putnam, 241-257. Cambridge, MA: Cambridge University Press, 1994. First published in 1950.

Cartwright, Nancy. *How the Laws of Physics Lie.* New York, NY: Oxford University Press, New York, 1983.

Cheyne, Colin. "Existence Claims and Causality." *Australasian Journal of Philosophy*, 76 (1998): 34-47.

Church, Alonzo. "Ontological Commitment." *Journal of Philosophy*, 55 (1958): 1008-1014.

Colyvan, Mark. "Can the Eleatic Principle be Justified?" *Canadian Journal of Philosophy*, 28 (1998), 313-335.

---. *The Indispensability of Mathematics.* New York, NY: Oxford University Press, 2001.

Davidson, Donald. 1970. "Mental Events". *Essays on Actions and Events*, edited by Donald Davidson, 207-225. New York, NY: Oxford University Press, 1980. First published in 1970.

Devitt, Michael. *Realism and Truth.* Princeton, NJ: Princeton University Press, 1991.

---. *Coming to our Senses.* Cambridge, England: Cambridge University Press, 1996.

Eddington, Sir Arthur. *The Nature of the Physical World.*

Excerpts in *Reality*, edited by C. Levenson, and J. Westphal, J, 144-149. Indianapolis, IN: Hackett Publishing, Indianapolis, 1994. First published in 1929.

Ellis, Brian. *Truth and Objectivity*. Oxford, England: Basil Blackwell Ltd., 1990.

Feynman, R., R. Leighton and M. Sands. *The Feynman Lectures on Physics*. Reading, MA: Addison-Wesley Publishing Company, 1963.

Field, Hartry. *Science Without Numbers*. Princeton, NJ: Princeton University Press, 1980.

---. *Realism, Mathematics, and Modality*. Oxford, England: Basil Blackwell Ltd., 1989.

Fine, Arthur. "The Natural Ontological Attitude." *The Shaky Game: Einstein Realism and the Quantum Theory* (second edition) by Arthur Fine, 112-136. Chicago, IL: The University of Chicago Press, 1994. First published in 1984.

Fraasen, Bas C. van. *The Scientific Image*. New York, NY: Oxford University Press, 1980.

Glymour, Clark. "Explanation and Realism." *Scientific Realism*, edited by Jarrett Leplin, 173-192. Berkeley, CA: University of California Press, 1984.

Goldman, Alvin. "A Causal Theory of Knowing." *The Journal of Philosophy* LXIV, no. 12 (1967): 357-372.

Goodman, Nelson and V. W. Quine. "Steps Toward a Constructive Nominalism." *Journal of Symbolic Logic* 12 (1947): 77-122.

Hacking, Ian. *Representing and Intervening: Introductory Topics In the Philosophy of Natural Science.* Cambridge, MA: Cambridge University Press, 1983.

Hale, Bob. *Abstract Objects*. Oxford, England: Basil Blackwell, 1987.

---. "Physicalism and Mathematics." *Objections to*

Physicalism, edited by Howard Robinson, 39-59. Oxford, England, Clarendon Press, 1993.

Harman, Gilbert. "The Inference to the Best Explanation." *The Philosophical Review* 74 (1965): 88-95.

---. "Ethics and Observation." *Essays in Moral Realism*, edited by Geoffrey Sayre-McCord, 199-124. Ithaca, NY: Cornell University Press, 1988. First published in 1977.

---. "Moral Explanations of Natural Facts - Can Moral Claims be Tested Against Moral Reality?" *The Southern Journal of Philosophy*, 24 (1986): 57-68.

Hempel, Carl G. "Studies in the Logic of Explanation." *Aspects of Scientific Explanation and Other Essays in the Philosophy of Science*, by Carl G. Hempel, 245-290. New York, NY: Macmillan Publishing, 1965. First Published in 1948.

---. "Aspects of Scientific Explanation." *Aspects of Scientific Explanation and Other Essays in the Philosophy of Science*, by Carl G. Hempel, 391-496. New York, NY: Macmillan Publishing, 1965.

Katz, Jerrold J. *Realistic Rationalism*. Cambridge, MA: The MIT Press, 1998.

Kim, Jaegwon and Ernest Sosa, editors. *A Companion to Metaphysics*. Oxford, England: Blackwell Publishers, 1995.

Kripke, Saul. *Naming and Necessity*. Cambridge, MA: Harvard University Press 1972.

Levin, Michael. "What Kind of Explanation is Truth?" *Scientific Realism*, edited by Jarrett Leplin, 124-139. Berkeley, CA: University of California Press, 1984.

Lewis, David. *Counterfactuals*. Malden, Ma: Blackwell Publishers, 1973.

Lipton, Peter. *Inference to the Best Explanation*. New York, NY: Routledge, 1991.

Mackie, J.L. *Problems from Locke*. New York, NY: Oxford

University Press, 1976.

McMullin, Ernan. "A Case for Scientific Realism." *Scientific Realism*, edited by Jarrett Leplin, 8-40. Berkeley, CA: University of California Press, 1984.

Nagel, Thomas. *The View From Nowhere*. New York, NY: Oxford University Press, 1986.

Oddie, Graham. "Armstrong on the Eleatic Principle and Abstract Entities." *Philosophical Studies* 41 (1982): 285-295.

Oliver, Alex. The Metaphysics of Properties." *Mind* 105 (1996): 1-80.

Peirce, C.S. 1908. "Abduction and Induction." *Philosophical Writings of Peirce*, edited by Justus Buchler, 122-144. New York, NY: Dover Publications, 1955.

Plato, *Sophist*.

Putnam, Hilary. "Philosophy of Logic." *Mathematics, Matter and Method: Philosophical Papers, Volume 1*, by Hilary Putnam, 323-357. New York, NY: Cambridge University Press, 1995. First published in 1972.

---. "The Meaning of 'Meaning'". *Basic Topics in the Philosophy of Language*, edited by Robert Harnish, 221-274. Englewood Cliffs, NJ: Prentice Hall, 1994. First published in 1975.

---. *Meaning and the Moral Sciences*. London, England: Routledge & Kegan Paul, 1978.

Quine, W.V. "On What There is." *From A Logical Point of View* by V.W. Quine, 1-20. Cambridge, MA: Harvard University Press, 1980. First published in 1948.

---. "Two Dogmas of Empiricism." *From A Logical Point of View* by V.W. Quine, 20-46. Cambridge, MA: Harvard University Press, 1980. First published in 1951.

---. "On Carnap's Views on Ontology." *The Ways of Paradox and Other Essays* by V.W. Quine, 203-211. Cambridge, MA: Harvard University Press, 1976.

---. "Logic and the Reification of Universals." *From A Logical Point of View* by V.W. Quine, 102-129. Cambridge, MA: Harvard University Press, 1980. First published in 1953.

---. "Carnap and Logical Truth." *The Ways of Paradox and Other Essays* by V.W. Quine, 107-132. Cambridge, MA: Harvard University Press, 1976. First published in 1954.

---. "Posits and Reality." *The Ways of Paradox and Other Essays* by V.W. Quine, 246-254. Cambridge, MA: Harvard University Press, 1976. First published in 1955.

---. *Word and Object*. Cambridge, MA: MIT Press, 1960.

---. "Existence and Quantification." *Ontological Relativity and Other Essays*, by V.W. Quine, 91-113. New York, NY: Columbia University Press, New 1969. First published in 1966.

---. "Goodman's Ways of Worldmaking". *Theories and Things*, by W.V. Quine, 96-99. Cambridge, MA: Harvard University Press, 1981. First published in 1978.

---. "Foreword." *From A Logical Point of View* by V.W. Quine, vii-ix. Cambridge, MA: Harvard University Press, 1980. *From a Logical Point of View*.

---. "What Price Bivalence?" *Theories and Things*, by V.W. Quine, 31-37. Cambridge, MA: Harvard University Press 1981. (Referred to in text as 1981a).

---. "Things and their Place in Theories." *Theories and Things*, by V.W. Quine, 1-23. Cambridge, MA: Harvard University Press 1981. (Referred to in text as 1981b).

Quinn, Warren. "Truth and Explanation in Ethics." *Morality and Action*, by Warren Quinn, 109-133. Cambridge, MA: Cambridge University Press, 1993. First published in 1986.

Resnik, Michael. *Mathematics as a Science of Patterns*. New York, NY: Oxford University Press, 1997.

Ruben, David-Hillel. *Explaining Explanation.* New York, NY: Routledge, Chapman and Hall, Inc., 1990.

Russell, Bertrand. "The Philosophy of Logical Atomism." *The Philosophy of Logical Atomism*, edited by David Pears, 35-155. LaSalle, IL: Open Court, 1985. First published in 1918.

Sayre-McCord, Geoffrey. "Moral Theory and Explanatory Impotence." *Essays in Moral Realism*, edited by Geoffrey Sayre-McCord, 256-281. Ithaca, NY: Cornell University Press, 1988.

Stroud, Barry. *The Quest for Reality: Subjectivism and the Metaphysics of Color.* New York, NY: Oxford University Press, 2000.

Sturgeon, Nicholas L. "Moral Explanations." *Essays in Moral Realism*, edited by Geoffrey Sayre-McCord, 229-255. Ithaca, NY: Cornell University Press, 1988. First published in 1985.

Varzi, Achille. "Words and Objects". *Individuals, Essence, and Identity, Themes of Analytic Metaphysics*, edited by A. Bottani, M. Carrara and D. Giaretta, 49-75. Dordrecth/Boston/London: Kluwer Academic Publishers, 2002.

Vinueza, Adam. "Realism and Mind-Independence". *Pacific Philosophical Quarterly* 82 (2001): 51-70.

Wiggins, David. *Needs, Values, Truth.* Oxford, England: Basil Blackwell, 1987.

Williams, Donald C. "On the Elements of Being: I." *Properties*, edited by D.H. Mellor and Alex Oliver, 112-139. New York, NY: Oxford University Press, 1997. First Published in 1953.

Wright, Crispin. *Truth and Objectivity.* Cambridge, MA: Harvard University Press, 1992.

Yablo, Stephen. "A Paradox of Existence" *Empty Names, Fiction and the Puzzles of Non-Existence*, edited by A. Everett and A. Hofweber, 275-312. Stanford, CA: CSLI Publications, 2000.