

FOUNDATIONAL ISSUES IN THE METAPHYSICS OF DAVID LEWIS

Francesco Nappo

A Thesis Submitted for the Degree of MPhil
at the
University of St Andrews and the University of Stirling



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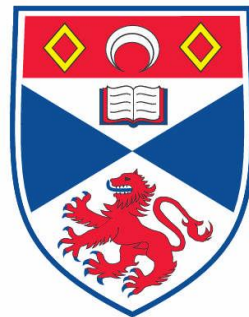
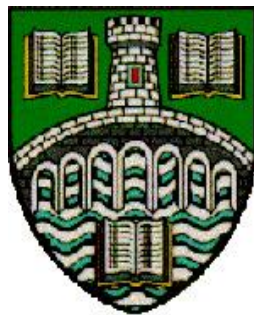
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Foundational Issues in the Metaphysics of David Lewis

Francesco Nappo



This thesis is submitted in fulfilment for the degree of MPhil
at the
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ABSTRACT

This dissertation contains two investigations concerning, respectively, the problem of ontic vagueness and the existence of a fundamental level of reality. As I argue in the introduction, evaluation of these two issues is of central importance for assessing the prospects for a kind of metaphysics inspired by the work of David Lewis. The two main chapters of the dissertation provide, in my view, enough material for a considered defense of Lewis's views on ontic vagueness and fundamentality. If my arguments are correct, Lewisian metaphysics remains an interesting project to defend and develop.

To my friends

PREFACE

Few contributions in the field of metaphysics can be compared, for their depth and impact, to the work of the American philosopher David K. Lewis. A feature of this work, which partly explain its great appeal, is its systematicity. Lewis's views on intrinsicity, naturalness, supervenience, mind and modality, to mention just a few themes, constitute a unified and connected body of doctrines. As Lewis himself acknowledged in the introduction to the first volume of collected papers: "I should have liked to be a piecemeal, unsystematic philosopher, offering independent proposals on a variety of topics. It was not to be" (Lewis 1983, p. XI).

Surely there is an element of beauty in this systematicity. But there is also an element of precariousness. For a body of doctrines has some vital organs: claims or assumptions that are so central to the life of the system that, if one were to reject them, the system as a whole would likely collapse. This seems to be true, in particular, of Lewis's metaphysical system. What I present here are two investigations concerning, respectively, the problem of ontic vagueness and the existence of a fundamental level. I believe that the evaluation of these two issues is of vital importance for assessing the tenability of Lewis's systematic metaphysics.

There is a general worry lurking behind my discussion, which it's worth making explicit here. The worry is that, if the justification for Lewis's claims on ontic vagueness and fundamentality turned out to be wanting or otherwise unsatisfactory, and if I am right to think that these theses are part of a number of central claims constituting the basis of his metaphysical system, then it seems we should start being suspicious of the very tenability of the Lewisian metaphysics as a whole.

What I will be arguing for in the two main chapters of this dissertation provides, in my view, enough material for a modest defense of Lewis's views on ontic vagueness and fundamentality. I will clarify the content of this modest defense, and explain its significance for the development of the contemporary debate in metaphysics, as well as for a redefinition of a kind of Lewisian metaphysics, in a brief note at the end of the introduction.

Before entering the philosophical discussion, some acknowledgments are in order. Many thanks to my supervisors Prof. Katherine Hawley and Dr. Aaron Cotnoir for their invaluable help and support at all stages of the writing of this dissertation. Prof. Hawley first introduced me to the philosophy of David Lewis, and I am particularly grateful to her for this reason.

Special thanks are also due to Prof. Daniel Nolan, who read several drafts of the two main chapters during my visit at the Australian National University, always providing me with excellent feedback. I am also grateful to the Endeavour Scholarships Program, which made my visit to ANU possible through their financial support.

I have benefited significantly from continuous exchange with students and faculty of the Philosophy departments of St Andrews and ANU. I feel extremely lucky and privileged to have been part of these philosophical communities, even though for a limited amount of time in each case. Thanks everyone for being so friendly and smart.

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INTRODUCTION

This introduction serves three purposes: first, to explain why the questions I will be addressing in the two main chapters of this dissertation can be rightly called “foundational issues” in Lewis’s metaphysics; second, to carefully present or reconstruct Lewis’s answers to these questions, as we find them throughout his writings; third, to point towards some problematic aspects of his justification for these answers. I will start in section one with the problem of ontic vagueness, moving on in section two to the question of the existence of a fundamental level.

1. Lewis on ontic vagueness

Might the world itself, independently of our representations of it, be vague? This is the problem of ontic vagueness. Lewis’s take on it is that the world itself cannot be vague. In this respect he follows a traditional view, tracing back at least to Bertrand Russell (1923), according to which vagueness is merely a *semantic* phenomenon: it has to do with the relationship between our words or concepts and the things in the world to which these words or concepts refer. As vagueness is, on this type of view, constitutively tied to human language and thought, it is a mistake to think that there could be vagueness in the world itself, independently of our representations.

Lewis’s denial of the possibility of ontic vagueness is tightly related to his endorsement of the popular doctrine of Supervaluationism as his preferred theory of vagueness. Supervaluationists treat vagueness as an extreme form of ambiguity (Fine 1975 defines vagueness as “*super-ambiguity*”). A statement is ambiguous when the terms and predicates it contains can be mapped out to more than one possible extension, e.g. the term ‘bank’ can be interpreted as referring to a credit institution or to a surface along the river. For the supervaluationist, a term or predicate is vague when it is ambiguous at a large scale; in other words, when there is a large number of alternative meanings that are consistent with our use of that term, even though they pick up slightly different extensions.

The way to provide a correct theory of vagueness which respects the law of excluded middle is therefore by simulating an ideal process of “semantic decision” through which every term and predicate of our language gets assigned a precise classical extension. The set of all possible semantic decisions which are compatible with our linguistic usage constitutes the space of *admissible precisifications*. For any sentence, an admissible precisification is a model for our language under which that sentence is either true or false. By quantifying over admissible precisifications, the supervaluationist obtains a semantics for vague languages such as English which preserves the law of excluded middle.

The fact that, under a supervaluationist framework, the distinction between ambiguity and vagueness turns out to be a merely superficial one helps us understand Lewis’s claim that the notion of ontic vagueness is “unintelligible” (cfr. Lewis 1986b, p. 212). It is in fact clear to anyone who knows what ambiguity is that it has to do with certain semantic features of the words and concepts we employ. Thus, with respect to the notion of ambiguity, it seems we could rule out the hypothesis that things themselves could be ambiguous just by virtue of common knowledge and our competence with the meaning of ‘ambiguous’ (cfr. Eklund 2011). But on the supervaluationist framework vagueness is viewed simply as an extreme form of ambiguity. Thus it may seem natural to the philosopher who endorses the doctrine of Supervaluationism that it is possible to rule out the hypothesis of vagueness in reality merely by virtue of competence with respect to the meaning of ‘vague’.

There is something deeply puzzling, if not problematic, in Lewis’s rejection of the notion of ontic vagueness as unintelligible, which the following remarks will try to bring out. When theorizing about the nature of the phenomenon of vagueness, one faces two distinct yet intimately related problems: that of answering the question of where vagueness comes from, and that of saying what is the correct logic of vagueness (and, relatedly, the correct semantics for a vague language). These two questions are related in an interesting, if initially perplexing, way. Plausibly, one cannot provide an answer to the former question without already presupposing at least an approximate answer to the latter, and *vice versa*. This, of course, does not make

theorizing about vagueness impossible. Hardly any theory about anything starts completely from scratch (in fact, what should rather seem impossible is that one could theorize about X without already taking at least a provisional position about issues related to X). Nor should this come as much of a surprise, given the relationship that, in the context of scientific theorizing, data and theory often entertain.

With this in mind, let's distinguish two stages of the philosophical theorizing about vagueness: the *pre-theoretical* and the *post-theoretical*. Pre-theoretically, the hypothesis that the phenomenon of vagueness might have its source in reality itself seems to be as good as an option as most others. In fact, if Russell (1923), Tye (1990) and others are correct, it may rather be true that on our ordinary conception vagueness can be a feature of things themselves (cfr. also chapter 1, section 2.1). Thus, if Lewis wants to reject the notion of ontic vagueness as pre-theoretically unintelligible, his position is highly problematic. However, it may be that Lewis intends to say that the notion of ontic vagueness is post-theoretically unintelligible. Indeed, if one is convinced by the assimilation of vagueness and ambiguity offered by the doctrine of Supervaluationism, there seems to be little reason to regard the notion of vagueness in reality as nothing more than a conceptual mistake.

Yet at this point the question arises: is the assimilation of vagueness and ambiguity actually plausible? Which leads us back to the question: is the phenomenon of vagueness a purely semantic phenomenon? A careful evaluation of this question is lacking in Lewis's writings; yet it is of crucial importance for the tenability of Lewis's metaphysics. For Lewis's views on vagueness have bearings on a number of doctrines that he held in metaphysics and the philosophy of language, having to do in particular with the existence and nature of ordinary objects. Here I want to signal some of the most interesting and delicate issues, without pretending to be exhaustive.

The first doctrine worth mentioning says that *existence is not vague*. In Lewis's view, although it is true that vagueness only resides in our thought and language, not all language is vague. In particular, the existential quantifier is not vague. What Lewis means by this is that it

cannot be a vague matter what falls under the extension of the existential quantifier. The doctrine of Supervaluationism is invoked to dismiss the hypothesis that existence could instead be vague. On the supervaluationist account, if the existence were vague, there must be a number of equally good candidate extensions associated with the (unrestricted) existential quantifier. As it is indeterminate which of these competing extension determines the meaning of ‘exist’, there would be things that exist according to one precisification and not according to another. But, Lewis asks, “What thing is this such that it is sort of is so, sort of isn’t, that there is any such thing?” (Lewis 1986b, p.213; cfr. also Sider 2003). Clearly, *nothing* can be in between existence and non-existence. Thus, under a supervaluationist framework, existence cannot be vague.

The second Lewisian doctrine says that *composition is not vague*. In the passage of *On the Plurality of Worlds* just quoted, Lewis argues that it cannot be a vague matter whether two or more things compose under certain circumstances a larger object – their mereological sum. For if it could be vague whether composition occurs in some circumstances there could be vagueness in how many things exist in the world. For example, if it could be a vague matter whether a group of ships in the Northern Sea compose a fleet, then it could be a vague matter how many objects are in the Northern Sea. But this, according to Lewis, is just equivalent to say that it could be a vague matter what falls under the extension of the existential quantifier, which he gave reasons to believe to be impossible. Therefore, composition cannot be vague.

The third Lewisian doctrine says that *composition is unrestricted*. Under any condition, given any pair of material objects, there is another object that they compose. This doctrine about the conditions under which composition occurs is known as Unrestricted Composition or Mereological Universalism (henceforth, UC). By predicting that there exist such things as an object having as parts my nose and the Eiffel Tower alone, UC appears to be in contrast with the folk opinion. As Lewis recognizes:

“We are happy enough with mereological sums of things that contrast with their surroundings more than they do with one another; and that are adjacent, stick together, and act jointly. We are more reluctant to affirm the existence of

mereological sums of things that are disparate and scattered and go their separate ways.” (Lewis 1986b, p.211)

It might seem that the right way to accommodate the folk opinion is to say that composition responds to the intuitive criteria of contrasting with their surroundings, sticking together, being adjacent, act jointly, and possibly others. But that, according to Lewis, cannot be right. For these criteria are clearly vague. But if it can be a vague matter whether the conditions are met for composition to occur, then composition can be a vague matter. But composition cannot be vague. Thus we shouldn't think that composition is restricted according to the intuitive criteria.

According to Lewis, the right way to accommodate the folk opinion which denies the existence of scattered object is in terms of restricted quantification rather than restricted composition. We should really be thinking that the reason why people are unhappy with affirming the existence of mereological sums of arbitrary objects is that they are using the existential quantifier in a restricted way, by only concentrating upon objects that conform to certain standards. But restricting quantification according to vague criteria is fine, as it doesn't imply vague existence. What it is not fine is to suppose that we are really speaking unrestrictedly about absolutely everything, and we are denying that composition occurs in every case, for that implies vague composition and vague existence (though cfr. Markosian 1998).

The doctrine of Unrestricted Composition is invoked by Lewis in many contexts, in particular with respect to questions concerning modality (e.g. trans-world individuals) and persistence (e.g. trans-temporal individuals). Here I want to mention just one significant application of this doctrine in the context of the resolution of a well-known metaphysical puzzle, the problem of the many. Unger (1980) compellingly argued for the truth of the following conditional: if there is at least one object X that satisfies a certain sortal predicate F (e.g. the sortal cat) then there are incredibly many other objects Y, Z, ..., which occupy roughly the same spatial region of X and also satisfy the sortal F (cfr. chapter 1, section 5). If sound, in any occasion in which we seem to recognize a composite object, say a cat, the argument would

force us to decide between two very unwelcome options: either deny that there is a cat there, or admit that there are thousands of them.

Lewis (1993) consider, and then dismisses, one possible escape route from the problem of the many, which appeals to the idea that common macroscopic things such as cats are *vague objects*. According to Lewis, the supposition that there such objects with unclear boundaries is a gratuitous posit. As he argues, we don't need vague objects. It is sufficient to solve (at least one version of) Unger's problem to have two doctrines at our disposal: Unrestricted Composition and Supervaluationism. The former takes care of the metaphysical side of the problem, by ensuring that there are plenty of objects competing for the title of best candidate to satisfy the sortal predicate F – a competition in which typically there is no clear winner; the latter takes care of the semantics, by predicting that, under any precisification of the predicate F, there is exactly one object in the relevant spatiotemporal region that satisfies it, even though it is true of no particular object in the relevant spatiotemporal region that *it* satisfies F. Thus the fourth Lewisian doctrine says that the existence of vague object is an “unparsimonious and unnecessary” (Lewis 1993, p.169) theoretical posit.

The four doctrines that I have considered constitute the bulk of Lewis's metaphysics of material objects. Interestingly, one might plausibly detect some sort of support relation between these theses: the doctrine that existence is not vague supports the doctrine that composition is not vague, which supports Unrestricted Composition, which supports the supervaluationist solution to the problem of the many. (In some cases, Lewis thought that the relevant support relation was one of entailment; but this has turned out to be controversial in all cases, cfr. Van Inwagen 1990, Markosian 1998, Hudson 2001).

What is important to stress here that this chain of doctrines find their final support in Lewis's system in the denial of the existence of ontic vagueness and the related endorsement of the doctrine of Supervaluationism. In particular, the influence of the supervaluationist framework on settling the question whether existence could be vague cannot be overstated. As I said, on the standard supervaluationist picture, the phenomenon of vagueness is associated with the

possibility of precisification. On this reading of what it is for some bit of our language to be vague, it may well seem plausible to think that the existential quantifier cannot be subject to precisification (but cfr. Barnes 2012). But, crucially, this leaves open the possibility that an alternative account of the phenomenon of vagueness could make perfect sense of the thesis that existence is vague (cfr. Van Inwagen 1990). Thus the thesis that existence cannot be vague cannot be detached from the specific context of the endorsement of the supervenience doctrine and, consequently, of the denial of ontic vagueness. And yet, what is the reason to believe that there is no vagueness in things themselves? This seems to be an open question that the Lewisian has to answer.

2. Lewis on the Fundamental Level

At the heart of Lewis's metaphysical system, is the thesis of Humean Supervenience. Via the doctrine of Modal Realism defended in *On the Plurality of Worlds* (1986b), Lewis shows how it is possible to reduce statements involving modal notions like necessity and possibility to statements which do not involve such notions. For example, the truth of the statement "Humphrey might have won the election" is explained in terms of the existence of an individual in the actual world, Humphrey, who lost the elections, and the existence of an individual in another possible world, related to Humphrey by some suitable counterpart relation, who instead wins the elections. Thus modal truths are reduced to non-modal truths.

Via the Humean account of laws of nature, Lewis shows how it is possible to reduce statements involving nomic notions, such as that of a law, to statements which do not involve such notions (cfr. Lewis 1986a). For example, the truth of "it is a law of nature that no particle can travel faster than light" is analyzed in terms of the truth of the universal generalization "no particle can travel faster than light" together with the fact that such generalization is contained in the best system of truths that account for all physical phenomena. In this way, nomic truths are shown to reduce to (and hence to be derivative upon) non-nomic truths.

By endorsing the doctrine of Physicalism, Lewis suggests that all truths about our universe could eventually be reduced to truths stated in purely physical vocabulary. In particular, on his view statements involving ascriptions of mental states like *being in pain* would be *a priori* knowable to someone who knew all the physical truths about our universe. Thus, one consequence of Physicalism is that it allows one to reduce phenomenal truths to physical truths (cfr. Lewis 1994b).

The doctrine of Humean Supervenience completes this elegant picture of the world by reducing all truths to truths about the distribution of fundamental local qualities in the spacetime. As Lewis explains the basic content of the doctrine:

“Humean Supervenience is named in honour of the great denier of necessary connections. It is the doctrine that all there is to the world is a vast mosaic of local matters of fact, just one little thing and then another. (But it is no part of the thesis that these local matters of fact are mental.) We have geometry; a system of external relations of spatio-temporal distance between points. Maybe points of spacetime itself, maybe point-sized bits of matter or aether field, maybe both. And at these points we have local qualities: perfectly natural intrinsic properties which need nothing bigger than a point at which to be instantiated. For short: we have an arrangement of qualities. All else supervenes on that.” (Lewis 1986a, p. IX)

The motivation for holding Humean Supervenience lies in its striking combination of simplicity and strength. The doctrine is simple because it avoids unwelcome commitments to any fundamental “pushing-and-pulling” of nature (Sider 2011), like the necessary connections between distinct existences that Hume famously rejected. As Lewis puts it:

“The point of defending Humean Supervenience is [...] to resist philosophical arguments that there are more things in heaven and earth than physics has dreamt of.” (Lewis 1994a, p.474)

Humean Supervenience also promises great explanatory power. If all there is to the world is the distribution of local qualities over spacetime, then it is ideally possible to describe everything that goes on in the physical world by simply describing what goes on at the level of fundamental entities and their qualities. Significantly, the doctrine acquires even more power

when combined with the endorsement of Modal Realism, the Humean account of laws of nature, and Physicalism, as in Lewis. For, under the assumption that modal, nomic and phenomenal truths reduce to non-modal, non-nomic, physical truths, the doctrine of Humean Supervenience delivers the appealing result that everything there is to the world of our experience depends on the supervenience base of the physical universe.

The strength and simplicity of Humean Supervenience explain why Lewis thought that the defense of this doctrine was an interesting and promising philosophical project. In recent years, however, philosophers have raised concerns about the tenability of the thesis that everything supervenes on the Humean mosaic. Probably the most important of these worries has to do with the compatibility of the doctrine of Humean Supervenience with the picture of the universe that is suggested by contemporary physics. Two issues in particular have been thought to make trouble for the thesis.

The first one concerns the compatibility of Humean Supervenience with quantum mechanics, arguably our most successful framework to account for and predict the microphysical phenomena that we observe. According to a standard view, the lesson we should draw from quantum mechanics is that the quantum world is *non-separable*: the properties assigned to a given quantum system fail to supervene on the properties of each individual in that system. Quantum non-separability is meant to create a problem for Humean Supervenience because it implies that there is more to the state of a system than the properties of the entities included in it. Some philosophers, however, have taken issue with the argument that Humean Supervenience is incompatible with quantum-mechanical phenomena by showing that it is possible to construct a theory of the quantum world that satisfies a non-trivial Humean Supervenience thesis (cfr. Loewer 1996). Evaluation of these issues is beyond the purposes of this dissertation.

The second concern, which will be the subject of chapter two of this work, has to do with the fact that the thesis of Humean Supervenience presupposes the existence of a level of fundamental entities and their local qualities, upon everything else supervenes. However, some

philosophers (e.g. Schaffer 2003) have argued that there is no compelling argument in favour of the existence of such a fundamental level of reality, and that therefore we should suspend judgment as to whether our world contains fundamental entities and properties. If that is correct, it seems that we should also suspend the judgment with respect to whether Humean Supervenience is true.

So is there a fundamental of reality? Lewis believed that there is one. His motivation for holding this view is however unclear. At some stage Lewis must have thought that the existence of such a level is necessary *a priori* (cfr. Lewis 1999, p.225, 291). Later in his work Lewis came to recognize the possibility of an infinite descent – a universe that lacks a fundamental level (cfr. Lewis 2009). However, he took this possibility to be so far-fetched that it couldn't possibly constitute a threat for the doctrine of Humean Supervenience, which he thought of as a contingent thesis about the actual world. Yet it is unclear what Lewis meant by the notion of “far-fetched possibility”, and why he thought the hypothesis of an infinite descent to fall under this concept.

One interpretative hypothesis has Lewis compare the hypothesis of infinite descent to that of well-known skeptical scenarios. The thought might be somewhat the following. Clearly, there is some non-zero chance that I am a handless envatted brain, whose neurons are stimulated by a machine in such a way that I have the experiences of the world that I actually have, even though I lack an appropriate link to the external world. So it seems entirely consistent with my phenomenal evidence that most of my beliefs about the world are in fact false. Yet the hypothesis is far-fetched, and we shouldn't take it seriously.

Similarly, one might think that the hypothesis of an infinitely descending chains of levels has approximately the same status as the hypothesis that I am a brain in a vat. If this was correct, it would seem as though that our belief in the existence of a fundamental level of reality is no more problematic than the belief that I have hands. However, there seem to be some important differences between denying that I have hands and denying that there must be a fundamental level of being. First of all, there seems to be a difference between the sources of evidence that

we have for holding these claims. While perceptual evidence plays a major role in engendering my belief in the fact that I have hands, the same is not (or at least not obviously) true in the case of my belief for the existence of a fundamental level.

Secondly, as Block (1993) points out, the reality of infinite descent is an open scientific question in a way that the reality of envatted brain isn't. In their search for the fundamental building blocks of nature, scientists have first postulated atoms; yet it turned out that atoms were themselves divisible into smaller particles, like electrons and protons, and then the latter were shown to be divisible into quarks and leptons. From this trend, some scientists have come to the conclusion that there might be no fundamental level of reality. After reviewing the debate on this issue between working scientists, Block concludes that:

“The hypothesis that there is no bottom level—that matter is infinitely divisible, with different properties at each level— appears to be an open question, not a mere philosopher's possibility like the possibility that the world was created 5 seconds ago complete with the evidence of an ancient provenance. (I mean ‘open question’ to contrast with ‘merely skeptical question’.)” (Block 1993, p. 143)

On another interpretation of Lewis's remarks, the hypothesis of infinite descent is claimed to be far-fetched only in the sense that, given the structure and discoveries of science, it is unlikely that the world turned out not to contain a fundamental level. Two kinds of arguments can support this conclusion. First, what we might call a *positive* argument: we have reasons from the structure and discoveries of science to believe that there is a fundamental level of reality. The strongest version of this argument starts from the observation that the best physical theories currently available postulate a number of ontological primitives, which are supposed to be constituents of the fundamental building blocks of nature. In chapter 2, section 5.1, however, I shed some doubts on the tenability of the claim that physics indicates the existence of a fundamental level.

The second, *negative*, argument says that we have reasons *not* to believe that the structure of the world is an infinitely descending hierarchy. (The negative argument is not equivalent to the positive because of the possibility of circular hierarchies; cfr. Bliss 2014). The strongest version

of this argument depends on the observation that, other things being equal, we should prefer simpler theories of the world to more complex ones. Since a theory predicting that our world contains a fundamental level is assumed to be simpler than one predicting an infinite descent of reality, it follows that in absence of conclusive evidence to the contrary it is reasonable to suppose that our world is not one of structures all the way down. In chapter 2, section 5.2, however, I argue against the assumption that theories which predict the existence of a fundamental level are necessarily simpler than theories who don't; this puts into question the tenability of the negative argument.

If that was the whole story about Lewis's justification for the existence of a fundamental level, I think we should probably conclude that Lewis's remarks are insufficient to save the doctrine of Humean Supervenience from the threat of presupposition failure. The problem for Lewis might be stated in Bayesian terms. Suppose I decide to attribute reasonably high credence 0.8 in the thesis of Humean Supervenience conditional upon the existence of a fundamental level. After careful evaluation of the evidence for the fundamental level, I then decide to attribute reasonably high credence 0.8 in its existence. But this implies that my absolute credence in the thesis of Humean Supervenience must drop significantly (to around 0.6), so that it is not clear anymore whether I should continue to support the doctrine, or rather withhold belief.

However, Lewis has more to say about how to defend Humean Supervenience from the threat of presupposition failure. In a footnote of "Ramseyan Humility", Lewis writes:

"[A problem arises about] the properties instantiated in an infinitely complex world of "structures all the way down".[...] For it may be that all of the properties instantiated in such a world are structural. If so, and if fundamental properties are never structural, we must conclude that in such a world no perfectly fundamental properties are instantiated, but only near-enough fundamental properties. We could then conclude that some of the privileges otherwise reserved for perfectly fundamental properties can belong instead to the near-enough fundamental properties that are instantiated in infinitely complex worlds: for instance, the privilege of appearing in fundamental laws of nature, or the privilege of

corresponding to universals or tropes, or the privilege of constituting a basis – not, however, a minimal basis – on which all else supervenes” (Lewis 2009, p. 219)

In other words, Lewis’s idea is that, even if the world turned out to be one of structures all the way down, it is still possible to individuate some “near-enough” fundamental properties such that it will be true of them that they vindicate Humean Supervenience. Hence, at least as I understand him, according to Lewis the thesis Humean Supervenience can be true also under the assumption that there is no perfectly fundamental level of reality.

In order for this proposal to be made to work, Lewis has to, first, provide a satisfactory account of how to individuate near-enough fundamental properties in a world of structures all the way down. What is it for a property to be near-enough fundamental? Second, he has to provide reasons to think that in a world of structures all the way down there *are* (or even there *must be*, as he suggests in the passage) near-enough fundamental properties. Otherwise, the claim that there are near-enough fundamental entities would seem no more justified than the claim that there are perfectly fundamental ones.

Lewis has a solution to these problems, which appeals to his much discussed notion of *naturalness* (cfr. Lewis 1983; also, Dorr and Hawthorne 2013). Some properties, according to Lewis, are more natural than others. What this means is hard to explain in few words, (Lewis admitted that the notion of naturalness may be unanalyzable), but basically the idea is that some properties are more suited to play a certain number of roles, including the roles of making for objective similarity between entities that possess these properties, as well as figuring in the fundamental laws of nature, serving as reference-magnets, and others. What matters here is that natural properties are defined on the basis of the role they play; how close a property comes to satisfy this role determines how much that property scores on the naturalness ranking.

Lewis’s solution to the first problem, that of providing a *principium individuationis* for near-enough fundamental properties, is therefore to define the latter properties as the ones that score ‘high enough’ in the naturalness ranking to satisfy all various the roles natural properties are supposed to cover. As for the second problem, it is plausible that Lewis thought of the existence

of properties which score ‘high enough’ in the naturalness ranking as a prerequisite of his theory of naturalness. In other words, the belief in the existence of some such properties is part of what it is to accept the natural/non-natural distinction. As Lewis thought that there are important and independent reason in favour of the distinction between more and less natural properties, he might have been happy to take the existence of fundamental or near-enough fundamental properties as something of a dogma.

Several worries can be raised about Lewis’s appeal to naturalness. Some philosophers are skeptical about the very distinction between natural and non-natural properties. Also, it may be argued that the existence of perfectly natural or near-enough perfectly natural properties is not actually a requisite of a satisfactory theory of naturalness. A full evaluation of these issues would require an extensive treatment of Lewis’s notion of naturalness, which is beyond the purposes of this introduction. In chapter 2, section 6, I am going to propose a way to make sense of Lewis’s suggestion in “Ramseyan Humility” which does not appeal to his controversial notion of naturalness, but rather to a (hopefully less controversial) notion of *completeness*.

3. Defending Lewis’s Metaphysics

I have already anticipated a number of themes that will be the object of discussion in the following two chapters. I want to conclude with few remarks on how the things I will be arguing for in the rest of dissertation can be thought of as constituting a defense of Lewisian metaphysics.

In chapter one, I will discuss whether we should believe in vagueness in reality. I will argue for two main theses: on one hand, that the standard arguments to the effect that the hypothesis of vagueness in reality is unintelligible or incoherent do not withstand much scrutiny; on the other, that some of the standard arguments in favour of the existence of vagueness in things themselves are similarly unconvincing. This leaves the Lewisian without the argument that the notion of ontic vagueness is not intelligible, but with enough room to argue that there is no need to suppose that vagueness is something more than just a semantic phenomenon.

In chapter two, I will take up the question whether we should believe in the existence of a fundamental level. After reviewing a priori and a posteriori arguments in favour of this hypothesis, I conclude that, in our current epistemic status, there is not enough evidence for us to suppose that there is a bottom layer of reality. In the rest of the paper, I develop Lewis's insightful idea of near-enough fundamentality in terms of the notion of completeness, and argue that there are substantive reasons to think that there is a complete level of reality. This leaves the Lewisian without the assurance that there are perfectly fundamental properties, but with enough room to defend their belief in Humean Supervenience and the related doctrine of Microphysicalism. (It is an interesting question whether this also leaves them with enough room to defend the belief in some other famously Lewisian doctrines; e.g. whether it is possible to restate the Principle of Recombination (Lewis 1986) in terms of near-enough fundamental properties, rather than perfectly fundamental ones).

If I am right, Lewisian metaphysics remains an interesting and promising philosophical project to defend and develop.

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VAGUENESS IN REALITY

1. The Problem

We know from experience that there are people who are definitely old and people who are definitely not old. But experience also tells us that there are borderline cases of old people. You wouldn't be surprised to hear, for example, that my father is neither clearly old nor clearly not old, as you would be if I told you that my father is neither clearly married nor clearly not married (being married, I assume, is a yes-or-no matter). If I were asked: "Is your father old?", I would probably reply that this is vague. It seems difficult to imagine a better answer. Hardly any other speaker of English could, in virtue of the information that is publicly available, settle the question as to whether my father is old. And no empirical investigation, no matter how long and detailed, could lead to a definitive answer. The vagueness of "My father is old" would not be defeated.

Among the questions that can be sensibly asked about the phenomenon of vagueness, one is of particular importance for metaphysics: where does vagueness come from? Orthodoxy says that vagueness originates from a deficiency in our modes of describing the world. Our linguistic practices with respect to the predicate 'old', for example, fail to sharply divide people into old and non-old ones. This common tendency of our words and concepts to leave room for borderline cases is ultimately imputable to our 'semantic indecision' (Lewis 1986, p.212) We have never actually made a decision, for example, as to when exactly a person starts counting as old (as opposed to, say, when a person starts counting as married); it is for this reason that, in some cases, it may be a vague matter whether some person qualifies as old or not.

In this paper, I discuss an alternative view concerning the source of vagueness, which I label 'the ontic view'. According to its defenders, at least some instances of vagueness have their source in the world itself (cfr. Tye 1990; Van Inwagen 1990; Smith and Rosen 1994; Morreau

2002; Akiba 2004; Williams 2008; Barnes and Williams 2011). Maybe the sentence “My father is old” is a case of semantic vagueness alone; still, according to these theorists there are instances of vagueness that cannot be accounted for except by tracing them back to a lack of precision of reality. So, in their view, the world itself might be vague.

The debate as to whether vagueness is a merely semantic or also an ontic phenomenon is an instance of a more general debate concerning the source of indeterminacy, by which I mean the general phenomenon of “unsettledness” that results in there being no fact of the matter as to whether a certain proposition is true or false. Is all indeterminacy semantic, i.e., due to features of the terms and concepts that we employ, or is some indeterminacy metaphysical, i.e., due to the world itself? Some philosophers think that all indeterminacy is semantic, and that therefore no indeterminacy can arise in virtue of facts about the world. The idea that the world might be vague implies, instead, that some indeterminacy is metaphysical in nature. But notice that the converse doesn’t hold. Indeed, one might consistently hold a hybrid view which allows for metaphysical indeterminacy but not ontic vagueness. Thus one might accept the considerations that are sometimes adduced in favour of the existence of some form of metaphysical indeterminacy (some of them are discussed in section three), without thereby committing to the ontic account of vagueness.

This paper addresses the specific question whether we have any reason to believe, or any reason not to believe, in the existence of vagueness in reality. In section two, I review the long-standing debate as to whether the notion of vagueness in the world is conceptually in good standing, showing that most arguments against the intelligibility of this notion are inconclusive. Section three makes some general methodological remarks concerning how best to conceive of the debate whether there might be vagueness in reality. In particular, I propose to interpret the claim supported by defenders of the ontic view as a plea for a generalized conception of vagueness, susceptible to investigation as to whether the relevant theoretical work of this notion is accomplished. Section four applies this methodology to a significant case-study, by discussing whether the hypothesis of vagueness in reality helps us solve Unger’s problem of the

many, as some authors have suggested (e.g. Morreau 2002). My conclusion is a moderately sceptical one: embracing the ontic view doesn't help with Unger's problem; more evidence is therefore needed to convince us to believe in vagueness in reality.

2. *Scepticism About Vagueness in Reality*

There seems to be a quick argument against the view that vagueness might somehow be built into the entities or states of affairs of the world. The argument is simply that the notion itself of vagueness in reality is unintelligible. A speaker who uses the predicate 'vague' competently should be able to recognize that only things like words and concepts can be vague; the states of affairs that we use them to represent cannot be – in a sense of 'cannot' in which we might say that ideas *cannot* sleep furiously. In this vein, Russell once wrote:

“Vagueness and precision alike are characteristics which can only belong to a representation, of which language is an example. [...] Apart from representation, whether cognitive or mechanical, there can be no such thing as vagueness or precision; things are what they are, and there is an end of it”. (Russell 1923, p. 85)

Russell's scepticism about the intelligibility of the notion of ontic vagueness continues to be the dominant view in contemporary analytic philosophy. Yet, at a closer look, there seems to be considerable disagreement among skeptics concerning what exactly is wrong with the notion of vagueness in reality. Some philosophers (e.g. Shapiro 2010) doubt that we can even meaningfully state the question whether there might be vagueness in reality. Some others (e.g. Wiggins 1986) raise concerns with the coherence of the hypothesis of ontic vagueness, in light of Evans's (1978) proof of the impossibility of vague identity. Still others complain that they simply can't grasp the concept (Eklund 2011), or they have been presented with a notion for which no definition is available (Lopez de Sa forthcoming). Finally, some theorists (e.g. Lewis 1993) point out that there is no intelligible picture of what it would be for reality to be vague.

I shall examine some of these worries - in order of strength – in what follows. By occasionally depending upon some recent work in defense of the ontic view (e.g. Akiba 2004,

Barnes 2006, Williams 2008, Barnes and Williams 2011), I shall argue that, when the traditional concerns about the notion of vagueness in reality are put under close scrutiny, they often turn out to be unfounded and, at any rate, indecisive. The moral is simple: contrary to what many philosophers have thought, the hypothesis of vagueness in reality can be taken seriously as an option on the table for metaphysical disputes.

2.1 Russell

It seems fair to start with a brief review of Russell's (1923) influential attack on the hypothesis of vagueness in reality. Russell begins his paper with a reflection on the influence of the features of our language to purportedly philosophical thinking:

“Reflection on philosophical problems has convinced me that a much larger number than I used to think, or than is generally thought, are connected with the principles of symbolism, that is to say, with the relation between what means and what is meant. In dealing with highly abstract matters it is much easier to grasp the symbols (usually words) than it is to grasp what they stand for. The result of this is that almost all thinking that purports to be philosophical or logical consists in attributing to the world the properties of language.” (1923, p.85)

Few lines later, he continues:

“Vagueness, which is my topic tonight, illustrates these remarks. [...] We hear a great deal about the flux and the continuum and the unanalysability of the Universe, and it is often suggested that as our language becomes more precise, it becomes less adapted to represent the primitive chaos out of which man is supposed to have evolved the cosmos. This seems to me precisely a case of the fallacy of verbalism - the fallacy that consists in mistaking the properties of words for the properties of things.” (*ibidem*)

To fully grasp the content of these passages, it will be helpful to use an example. As with many other mountains, the boundaries of Kilimanjaro are unclear. There are, for example, rocks around its borders of which it's very hard to tell whether they are part of the mountain or not. A conclusion that someone considering this situation might find tempting is that the mountain Kilimanjaro is a *vague object*, an entity with imprecise boundaries. However, this conclusion is,

according to Russell, representative of the fallacy of verbalism. For what is really vague, he would say, is not the mountain Kilimanjaro, but the name 'Kilimanjaro'. In fact, there are no vague mountains – rather it's vague what our names for these mountains refer to. As Lewis (1986) once put this idea:

“The reason it's vague where the outback begins is not that there's this thing, the outback, with imprecise borders; rather there are many things, with different borders, and nobody has been fool enough to try to enforce a choice of one of them as the official referent of the word 'outback'” (Lewis 1986, p. 212)

What's remarkable in Russell's passages is his reflection on the source of the mistake that leads philosophers to posit vagueness in things themselves. On Russell's view, the initial appeal of the idea of vagueness in reality exemplifies a general tendency of human thought, which consists in projecting features of language to the world. This tendency to mistake the properties of our language for properties of the world itself is largely unconscious, and it is more common among philosophers as they tend to deal with “highly abstract matters” (*ibidem*), where the fallacy becomes harder to detect. Idealists, according to Russell, were particularly blameful for elevating this mistaken habit of thought to a philosophical stance, by asserting the identity of representation and what is represented.

This is all very interesting – and perhaps also true. *If* there is a mistake in thinking that there is vagueness in reality, it has likely been produced by a certain confusion between representation and reality. The problem, however, is that Russell doesn't explain why it is a mistake in the first place to think that there could be vagueness in things themselves. What prevents vagueness and precision to also be predicates of things themselves, in addition to representations? Russell doesn't say. Thus, for however interesting and instructive they are, Russell's observations fail quite dramatically to give reasons against the hypothesis of vagueness in reality.

2.2 Dismissivism

Following some underdeveloped suggestions in Russell (1923), Shapiro (2010) argues that the question itself whether vagueness might be a feature of things themselves is a bad question, as it presupposes that there is a neat distinction to be made between what pertains to representation and what pertains to reality alone, when in fact there is no such distinction. In Shapiro's view, the lesson that we have learnt from the work of Kant and Putnam is that it is impossible to "factor out" the representational and non-representational elements of the world. Rather, we should think of the representational and non-representational facts as organized in a spectrum with various gradations. From this perspective, Shapiro argues, it makes little sense to ask whether vagueness might be a feature of the non-representational element of the world alone¹.

A first thing to note about Shapiro's argument is that he is assuming a particular understanding of the question whether there might be vagueness in reality. For it is certainly true that, when philosophers ask whether vagueness has its only source in representations, or also in the world itself, they are usually assuming that there is some distinction between matters of representation and matters of reality. So, for example, if someone asks whether the sentence "My father is old" is indeterminate in truth-value because of a vagueness in the predicate 'old', or rather because of a vagueness in the property of being old, it's implicit that they believe it possible to 'factor out' the linguistic from the worldly contribution to the indeterminacy of that sentence. Yet the assumption that it is possible to factor out the representational and the non-representational element of the world does not have to be a constitutive part of the thesis of vagueness in reality, for the simple reason that an idealist, who thinks that there is no distinction at all between representation and reality, might consistently endorse the ontic view of vagueness. Indeed, for an idealist, representational vagueness *just is* ontic vagueness! So, unless they deny the occurrence of vagueness, idealists would likely be willing to endorse the ontic view.

¹ Incidentally, Shapiro suggests, correctly in my view, that this was the concern that Dummett had in mind when, in "Wang's paradox", he claimed that "the notion that things themselves might actually be vague, as well as being vaguely described, is not properly intelligible" (Dummett 1975, p. 236)

Thus the question that Shapiro must regard as philosophically misguided, because constitutively based on a false presupposition, is the question whether vagueness might be a feature of things themselves, *as opposed to merely of our representations*. Put in this contrastive form, this question clearly presupposes a distinction between matters of representation and matters of reality. However, there are two problems with this move. First, is it fair to characterize the question of ontic vagueness in this way? Surely this is the way philosophers currently engaged in the debate over ontic vagueness usually formulate the question. But it may be argued that this is not the correct formulation of the question, in which case Shapiro's criticism would not apply.

Even granting that it is fair to formulate the question of ontic vagueness in the way Shapiro is assuming, a second worry can be raised against his argument. To express this worry as clearly as possible, let's first of all distinguish two views. *Dismissivism* is the view that says that there is no distinction to be made between representation and reality. *Non-dismissivism*, on the other hand, is the view that admits some distinction between representational and non-representational facts. But it is clearly one thing to say that there is some distinction between representation and reality, another to say that this distinction must be clear-cut. These two claims may not come together. What we might call *naive non-dismissivists* think that there is a neat distinction between matters of representation and matters of reality; *critical non-dismissivists* believe in the distinction but not in its neatness.

The worry can now be formulated as follows. When Shapiro claims that the question of ontic vagueness is based on a false presupposition, is he siding with the dismissivist, claiming that there is no distinction between representation and reality, or is he siding with the slightly weaker view of the critical dismissivist, claiming that there is no clear-cut distinction between representational and non-representational facts? (Incidentally, the same sort of interpretative concern also arises with Putnam's "internal realism" (Putnam 1983), whose formulation is often ambiguous between dismissivism and critical non-dismissivism.) Different problems arise if one goes for one interpretation or the other.

The hypothesis that Shapiro sides with the dismissivist renders his argument dialectically uninteresting. For the claim that there is something wrong with the question of vagueness in reality would then just be an instance of the more general thesis that there is something wrong with some of the most important questions that metaphysicians are trying to answer – questions concerning the reality of certain features of our experience. This is fair enough, but the interesting issue was about whether there is something *especially* wrong with asking the question whether there might be vagueness in reality. Maybe Shapiro thinks that there is nothing especially wrong with this question, i.e. that it is just one of many wrong questions that metaphysicians ask; in which case, I suppose, defenders of the ontic view would rather like to be given an argument for the general thesis of dismissivism, than simply a statement of one of its consequences. Indeed, in the absence of such an argument, it would still be at least excusable for them to assume that there is actually nothing wrong with the question of ontic vagueness.

Under the hypothesis, on the other hand, that Shapiro sides with the critical non-dismissivist, his argument is a *non sequitur*. For the question whether there might be vagueness in things themselves, as opposed to merely in our representations, is a perfectly sensible question to ask even though there is no clear-cut distinction between representation and reality. Just as there may be clear cases of a red surface and clear cases of a blue surface, even though there is no clear-cut distinction between red and blue, so there could be clear cases of representational facts and clear cases of non-representational facts, even though the distinction between representational facts and non-representational facts is somehow blurred. Hence, just as the fact that there is no clear-cut distinction between red and blue doesn't make it illegitimate to ask whether a certain surface is red or blue, so the fact that there is no clear-cut distinction between representation and reality shouldn't make it illegitimate to ask whether vagueness affects representations alone, or also reality.

My conclusion, therefore, is that Shapiro's argument targets the question of ontic vagueness only in so far as it shows that the latter is one of a number of questions whose intelligibility depends upon the existence of a distinction between the representational and the non-

representational elements of the world. If one is unmoved by dismissivist arguments against this distinction (as I think one should be, even though I won't defend this claim here), one should thereby also be unmoved by Shapiro's claim that the question of ontic vagueness is unintelligible.

2.3 The "lack of a picture" argument

A common source of concern about the hypothesis of vagueness in reality is that there seems to be no clear and well-defined sense in which things might themselves be vague, and without such a picture our belief in the idea that the world may be vague unjustified and irrational. This worry may be spelled out in different ways. Indeed, there are different things that one might expect to be covered by an answer to the question: "What is ontic vagueness?" One might, for example, expect a definition or a conceptual analysis of this notion. Less demandingly, one might ask for a reasonably informative account or a model of what it would be for the world to be vague.

The first kind of requirement is, presumably, what Sainsbury (1994) has in mind when he submits that defenders of ontic vagueness do not have "an account of what it would be for an object to be vague" (it is clear from the discussion that the kind of "account" he has in mind is a proper definition). In defense of Sainsbury, it must be said that defenders of vagueness in reality have not provided an adequate definition of vagueness in reality. Barnes (2006) proposes to define vagueness in reality as that kind of vagueness that, were we to speak a perfectly precise language (or were omniscient beings), would still arise from the world itself. But this kind of negative definition may not satisfy the sceptic. As Eklund (2011) notes, one might be able to define metaphysical ambiguity as that ambiguity that arises once all language has been disambiguated. Still, Eklund notes, metaphysical ambiguity would make no sense to anyone, as it is clear that ambiguity is a constitutively linguistic phenomenon. Thus, Barnes's attempted definition appears to be more of an useful heuristics for individuating cases of ontic vagueness than a proper definition.

So it must be admitted that defenders of the ontic account have a hard time trying to define ontic vagueness. But why ask for a definition? There is little doubt that, at least in ordinary cases, providing a definition of a notion in terms of other, independently grasped notions is sufficient to ensure that the *definiendum* will be properly understood. If, for example, we were to provide a definition of knowledge in terms of justified true belief, then we would imply that one would need no other concepts than that of justification, truth and belief to understand the concept of knowledge. However, it is extremely questionable that the possibility of providing a definition for a certain notion is a necessary condition for its proper intelligibility. It is plausible that some of the most central and useful concepts of ours are in fact undefinable. Arguably, the notion of vagueness itself, even under the traditional semantic account, is one of them. But of course that is no threat to its proper intelligibility.

A more plausible idea might be that, even if in general a definition of a certain notion is not necessary to engender understanding, a definition of ontic vagueness is somehow required by the particular dialectic we are in. Many people know what vagueness is; but they fail to understand what vagueness in reality might amount to; hence they are permitted to require a definition – and if there is no definition, they are permitted to reject the notion as obscure and unintelligible. It seems to me that this requirement is also incorrect, but will leave this point aside for the moment. I will discuss a plausible alternative to providing a definition of vagueness in reality in section three.

What about the second requirement, that of providing a picture of what it is for the world to be vague? This is the requirement that Lewis (1993) puts forward when discussing the idea that there could be vague objects:

“How, for instance, shall I think of an object that is vague in its spatial extent? The closest I can come is to superimpose three pictures. There is the *multiplicity* picture, in which the vague object gives way to its many precisifications, and the vagueness of the object gives way to differences between precisifications. There is the *ignorance* picture, in which the object has some definite but secret extent. And there is the *fadeway* picture, in which the presence of the object admits of degree, in

much the way that the presence of a spot of illumination admits of degree, and the degree diminishes as a function of the distance from the region where the object is most intensively present. None of the three pictures is right. Each one in its own way replaces the alleged vagueness of the object by precision. But if I cannot think of a vague object except by juggling these mistaken pictures, I have no correct conception.” (Lewis 1993, p. 105)

This kind of skepticism, though respectable, leaves itself open to an outright rebuttal. It seems to me that the lack of the “clear and correct” picture of ontic vagueness that Lewis is complaining about is rather due to under-exploration in this area than to objective features of this notion. Here I am going to argue that the recent literature provides us with multiple sufficiently satisfactory models of what it would be for the world to be vague. In light of this new evidence, the complaint that there is no clear picture of ontic vagueness loses much of its force.

The accounts that I will present here are Akiba’s (2004) and Williams’s (2008). The idea that both Akiba and Williams develop is to think of ontic vagueness in close analogy with a very popular account of semantic vagueness, namely the doctrine of Supervaluationism. In the standard supervaluationist framework, vagueness is associated with a characteristic kind of susceptibility to borderline cases that constitutively involves the possibility of *precisification*. On this type of view, whenever a statement p is indeterminate in truth-value as the result of vagueness, there are different equally good ways of sharpening or precisifying the extensions of the terms and predicates involved in p in such a way that p results either determinately true or determinately false. So, for example, there are different ways of precisifying the terms and predicates of the sentence “My father is old” in such a way that “My father is old” turns out to be either determinately true or determinately false (e.g., assigning to the predicate ‘old’ the set of all people who are at least 65 years, 1 month, 1 day and 1 second old).

In the standard supervaluationist framework, a precisification must respect certain conditions of *admissibility*. First, it must respect the speaker’s usage: things that speakers recognize as clear instances of old (non-old) people must remain so under all precisification. Thus, a

precisification is admissible only if every sentence which is determinately true (false) before precisification is determinately true (false) after precisification. Second, admissibility involves respecting certain “penumbral connections” (cfr. Fine 1975), most importantly: if X is a better candidate for being an old person than Y, then it cannot be the case that a precisification that makes Y an old person doesn’t also make X an old person. If, for example, my uncle is one year older than my father, it is inadmissible a precisification under which my father results old but my uncle doesn’t. Supervaluationism accounts for the indeterminacy in truth-value of statements such as “My father is old” by showing that they are true on some but not all admissible precisifications.

Along similar lines, Akiba (2004) and Williams (2008) propose a precisificational account of ontic vagueness. The idea behind these accounts is that, whenever a statement *p* is indeterminate as the result of ontic vagueness, there are several equally suitable ways of ‘precisifying’ or ‘sharpening’ reality, in such a way that *p* obtains in some of these ‘ontic precisifications’ and doesn’t obtain in some others.

The success of these precisificational accounts relies in great part in specifying what sort of thing is an ontic precisification of the world. Akiba (2004) proposes to conceive of the set of precisifications that a vague state of affairs gives rise to as a *sui generis* dimension of the world, in close parallel to the temporal and modal dimensions that we already recognize when dealing with time and necessity. This precisificational dimension is made up by precisificationally possible worlds, namely worlds in which everything is precise. On this type of view, the claim that things themselves might be vague amounts to the idea that there are several precisificationally possible worlds which, despite being different, all ‘correspond to’ or ‘represent’ equally well reality².

Williams (2008) proposes a more sophisticated account of the status of ontic precisifications, which has the advantage that it does not posit a *sui generis* precisificational dimension of the

² The relation of correspondence here is to be intended in close analogy with the relation that holds between possible worlds and the actual world in the modal framework. Both Akiba and Williams remain neutral on how best to characterize this notion, in particular whether it should be understood as *sui generis* or analyzable in terms of other notions.

world, but finds conceptual room for ontic vagueness within a more standard possible-world (i.e., modal) framework. On this account, an ontic precisification is a precise possible world; thus, the idea that there is vagueness in reality amounts to the claim that multiple precise possible worlds are actual. So, if a statement p is indeterminate owing to vagueness in reality, there exist several possible worlds where p either definitely obtains or fails to obtain, and all these worlds are actual. A consequence of Williams's account is that, if there is ontic vagueness, the standard assumption that there is a unique possible world that correctly represents or corresponds to reality needs to be abandoned. But Williams contends that there are no compelling arguments to support the idea that only one possible world is actual, i.e., corresponds perfectly well to reality³.

Set aside small differences in matters of details, Akiba's and Williams's models for ontic vagueness share many important virtues. For one thing, both these accounts employ pretty standard philosophical tools for theorizing about ontic vagueness, such as modal (or quasi-modal) theoretical machineries. Moreover, once it has been clarified what an ontic precisification is, theorizing about ontic vagueness becomes quite natural, at least for those who are already familiar with the supervaluationist framework. For example, it becomes possible to specify what it is for a statement to be true in the presence of a vague world. In Akiba's framework, a statement p is determinately true (false) if and only if it is true (false) in all precisificationally possible worlds; similarly, in Williams's account p is determinately true (false) if and only if it is true (false) in all actual worlds. An indeterminate statement is true on some but not all ontic precisifications, just as in the supervaluationist framework a vague statement is true on some but not all semantic precisifications.

Thus, it seems to me that both Akiba's and Williams's accounts pass the test for providing an adequate model of what it would be for the world to be vague. Of course, concerns might be raised about whether we can really understand what it is for the world to be ontically

³ The denial of the one-actuality thesis is, in fact, a feature and not a defect of Williams's proposal, as it reflects very neatly the claim, supported by defenders of ontic vagueness, that it is impossible, not only as a matter of fact but also in principle, to unequivocally describe the facts in the world in perfectly precise terms.

precisifiable. But given that, on Akiba's and Williams' account, what it is for the world to be vague *just is* for it to be ontically precisifiable, the complaint that we don't really understand the latter notion is just equivalent to the complaint that we don't really understand the former notion. In section three, I will argue against the worry of unintelligibility on grounds that it is based on a misguided picture of understanding.

2.4 Evans's argument

In 1978, philosopher Gareth Evans wrote a one-page paper that announces itself as a *reductio* of the idea that there could be vague objects. Here is, in brief, the argument. Let 'a' and 'b' be singular terms and suppose it is indeterminate whether $a=b$. Then b has the property of being such that it is indeterminate whether it is identical to a . But a does not have this property, as it is determinate that a is identical to a . Since a and b do not have the same properties, they are, by Leibniz's Law, distinct. Put formally:

- | | | |
|-----|----------------------------------|----------------------------|
| (1) | $\nabla (a = b)$ | (assumption) |
| (2) | $\lambda x [\nabla(x = a)]b$ | (from 1) |
| (3) | $\neg\nabla (a = a)$ | (premise) |
| (4) | $\neg\lambda x [\nabla(x = a)]a$ | (from 3) |
| (5) | $a \neq b$ | (from 2, 4, Leibniz's Law) |

where ' $\lambda x [\nabla(x=a)]b$ ' and ' $\neg\lambda x [\nabla(x=a)]a$ ' mean, respectively, 'b has the property of being such that it is indeterminate whether it is identical to a ' and ' a does not have the property of being such that it is indeterminate whether it is identical to a '.

Evans doesn't explicitly say what his result is meant to show with respect to the idea that there could be vague objects. First, notice that the deduction (1)-(5) isn't a *reductio ad absurdum*, since the assumption (1) and the conclusion (5) aren't strictly speaking contradictory. Evans notes, however, that given an adequate logic for the indeterminacy operator ' ∇ ', namely

S5, a contradiction follows⁴. Also, as it stands, the main target of Evans' argument seems to be the impossibility of indeterminate identity statements, not of vague objects, as it starts from the assumption that it is indeterminate whether $a=b$ and concludes in five steps that a is distinct from b . This is a striking result, since it seems uncontroversial that some identity statements may be genuinely indeterminate in truth-value. An example is: "Pardon= London", where 'Pardon' refers to Paris if A, and it refers to London if not A, and it is indeterminate whether A occurs⁵. The statement Pardon=London is evidently indeterminate in truth-value. So, it cannot be the case that Evans's target is the impossibility of genuinely indeterminate identity statements.

Let's go through the argument more carefully. The argument is classically valid, so if we want to reject the unpleasant conclusion of Evans's argument, namely that there are no genuinely indeterminate identity statements, we need to deny one of the premises or the inference rules. Premise (3) seems to express an obvious thought, namely that it cannot be indeterminate whether an object is identical with itself. The inference from (2) and (4) to (5) relies on an application of the contrapositive of Leibniz's Law (if a and b have the same properties then they are the same thing) together with classical logic. The steps from (1) to (2) and from (3) to (4) rely on an application of the same inference rule:

(λ -abstraction) FROM: 'It is indeterminate whether $P(X)$ ' INFER: X is such that
it is indeterminate of it whether $P(X)$.

The most obvious place to look at if one wishes to preserve the possibility of genuinely indeterminate statements is the latter inference rule. As Lewis (1988) notes, the inference is fallacious when we substitute the indeterminacy operator "it is indeterminate whether" with the contingency operator "it is contingent that...". If it is contingent that, say, the number of planets is nine it doesn't follow that the number of planets is such that it is contingent that it is nine. In this case we say that the expression 'the number of planets' is a not rigid designator. By

⁴ See Heck (1998) for a detailed proof.

⁵ This example is by Williamson (1994)

analogy, we may expect that the inference rule concerning the indeterminacy operator is valid when the term in question is, in some sense, rigid, whereas it fails when it is not.

Of course there is no available distinction between rigid and non-rigid terms in the case of the determinacy operator, as opposed to the necessity operator; but the vague-precise distinction will do the work. For a term to be precise is for it to denote the same object under all precisifications; a term is vague, instead, just in case it denotes different objects under different precisifications. Thus, preciseness is analogous to rigidity (for a term to be rigid is for it to denote the same object in all possible worlds); vagueness is analogous to non-rigidity (for a term to be non-rigid is for it to refer to different things in different possible worlds).

Suppose, therefore, that it is indeterminate whether $a = b$. If the indeterminacy in question is semantic, then at least one of ' a ' and ' b ' must be vague. But then the inference from "it is indeterminate whether $a = b$ " to " a is such that it is indeterminate whether it is identical to b " fails for the reason just given: ' a ' and ' b ' are not rigid, and therefore the application of the inference rule (λ -abstraction) does not preserve truth. Thus, if we hold that the indeterminacy of " $a = b$ " lies with the vagueness of the names ' a ' and ' b ', we can easily avoid the unpleasant conclusion that there are no genuinely indeterminate identity statements.

On the other hand, the same response is not available if we hold that the indeterminacy of " $a = b$ " is metaphysical in nature; if, in other words, " $a=b$ " is a metaphysically indeterminate identity statement. For, in that case, the indeterminacy would not lie with the names ' a ' and ' b ', but rather with the referents of ' a ' and ' b '. But since the names ' a ' and ' b ' are not vague, it follows that the inferences from (1) to (2) and from (3) to (4) in Evans' argument are valid, and so is deduction (1)-(5): a and b are distinct whenever it is metaphysically indeterminate whether they are identical. Moreover, assuming the logic S5 for the indeterminacy operator ' ∇ ', we obtain a contradiction.

Does the impossibility of metaphysically indeterminate identity statements refute the idea that there could be vagueness in reality? Here is one reason to think that it does. Suppose we

apply Evans' argument to the case of allegedly vague objects, like Kilimanjaro. On the picture of ontic vagueness proposed by Akiba and Williams, Kilimanjaro has many ontic precisifications – perfectly precise mountains – such as it is indeterminate which of these precisifications corresponds to the actual mountain. Since it may be thought to be indeterminate which of its precisifications Kilimanjaro is identical to, one could think of substituting 'a' and 'b' in Evan's argument with, respectively, 'Kilimanjaro' and an arbitrarily selected ontic precisification of it, say, 'Kilimanjaro(+)'. Then one could argue as follows:

Suppose it is indeterminate whether Kilimanjaro=Kilimanjaro(+). Then Kilimanjaro(+) has the property of being such that it is indeterminate whether it is identical to Kilimanjaro. But Kilimanjaro does not have this property, as it is determinate that Kilimanjaro is identical with itself. Since Kilimanjaro and Kilimanjaro(+) do not have the same properties, they are, by Leibniz's Law, distinct. A contradiction follows by assuming a suitable logic for the 'determinately' operator, namely S5.

What this Evans-style argument shows is that defenders of ontic vagueness cannot consistently embrace the view that a vague object like Kilimanjaro is vaguely identical to any of its precisifications. For recall that, on their account, what exhibit vagueness is not the name 'Kilimanjaro' but rather the referent of it, Kilimanjaro itself. Thus, in their view, 'Kilimanjaro' and 'Kilimanjaro(+)' are precise names. But precise names function as rigid designators and so they verify the inference schema (λ -abstraction). In turn, this implies that the deduction (1)-(5) is sound.

The argument above need not worry defenders of vague objects. For they need not commit to the claim that it is indeterminate whether Kilimanjaro = Kilimanjaro(+). Indeed, it is consistent with their view to think that Kilimanjaro is always determinately distinct from any of the precise objects in the vicinity. On Akiba's (2004) precisificational account of ontic vagueness, for example, it is never the case that Kilimanjaro is identical with any of its ontic precisifications (and not even indeterminately identical). Kilimanjaro may *coincide* with a precisification at some precisificationally possible worlds, but never be *identical with* one of them (just as, according to perdurantists, an object may be distinct from another at one time, but coincide with

the other at a later time along the temporal dimension). The reason is quite obvious: Kilimanjaro is a vague object, which extends over the precisificational dimension, whereas the ontic precisifications are precise. Thus, one way to escape Evans's *reductio* would just be to deny that there are metaphysically indeterminate identity statements of any sort.

Although this is a coherent view to support, it must be recognized that the great majority of defenders of ontic vagueness commit themselves to the existence of some metaphysically indeterminate identities. Some philosophers may think that metaphysically indeterminate identities are a useful tool in metaphysical and ethical debates, and may therefore explicitly commit to them⁶. More importantly, a commitment to metaphysically indeterminate identities may be sometimes implicit in certain doctrines that defenders of ontic vagueness embrace. Hawley (2002), for example, suggests that vagueness in existence entails, under reasonable assumptions, the possibility of metaphysically indeterminate identities. Suppose, for instance, that we hold a view about composition on which it is indeterminate whether fleets exist; now consider the set of all existing material things, call it 'A', and the set of all existing material things except for fleets, call it 'B'. Assuming the axiom of extensionality of set theory, A is identical to B if and only if there are no such things as fleets. But since it is indeterminate whether fleets exist, it is thereby indeterminate whether A is identical to B; further, this indeterminacy must arise from the world itself⁷.

Defenders of vague objects who commit themselves, implicitly or explicitly, to some metaphysically indeterminate identities need a different way to block Evans's argument. There are several solutions in the literature (e.g. Heck 1998, Van Inwagen 1990, Parsons and Woodruff 1995) The best response to Evans's argument that I am aware of is proposed in Williams (2008), and is based on his "multiple actualities" model of ontic vagueness that I have presented in the section 1.4. Williams considers cases of allegedly metaphysically indeterminate identities such as the fission of an enduring object. This is a classical case in which defenders of

⁶ For a defence of the theoretical usefulness of metaphysically indeterminate identities, see Parsons and Woodruff (1995) and Williams (2008)

⁷ Hawley (2002) argues that defenders of vague objects may plausibly restrict the axiom of extensionality of set theory, so as to avoid incurring in Evans's *reductio*.

a vague ontology may be willing to commit to some metaphysically indeterminate identities. Williams's example is the case of an amoeba, Sue, which splits in two "daughter" amoebas, Sally and Sandy, by fission. Is Sue identical with Sally or Sandy? There seems to be no fact of the matter. Some philosophers may find appealing the idea that the indeterminacy does not lie with the names 'Sally' or 'Sandy' but with the world itself. Is this idea coherent?

The framework of multiple actualities provides a principled way of responding to the charge of incoherence that comes from Evans's argument. The basic idea is to diagnose an instance of semantic indeterminacy in the names flanking the identity sign of a metaphysically indeterminate identity statement. On Williams's account, the idea that it is metaphysically indeterminate whether Sue is identical with Sally or Sandy amounts to the claim that there are two possible worlds, one where Sue=Sally, and the other where Sue=Sandy, and these worlds are both actual. Now, the name 'Sue' is not vague: it rigidly refers to Sue in both worlds. But the names 'Sally' and 'Sandy' are referentially indeterminate: in one world, 'Sally' refers to the enduring amoeba, whereas in the other it refers to the new amoeba; similarly for 'Sandy'. Thus, the names 'Sally' and 'Sandy' are semantically indeterminate *in virtue of* there being metaphysical indeterminacy as to which amoeba Sue is after fission. But since 'Sally' and 'Sandy' do not rigidly refer to a single amoeba in all actual worlds, the abstractive steps of Evans's argument are not valid. In turn, this implies that the identity statements "Sue=Sally" and "Sue=Sandy" can be metaphysically indeterminate without contradiction (and without rejecting classical logic).

There may be concerns about whether Williams's account does not lead to a redundant or unparsimonious picture of the source of vagueness (which is in the case of vague identity statements both ontic and semantic - even though semantic only in virtue of it being ontic). Evaluation of this and similar issues is beyond the scope of this discussion. What matters here is simply to have shown that Evans's argument does not show in a definitive way that the hypothesis of vagueness in reality is incoherent. Together with the previous conclusions, this

demonstrates that the traditional concerns over the intelligibility of ontic vagueness are unfounded.

3. Philosophical Methodology and the Problem of Ontic Vagueness

In the previous section, I have argued that the traditional concerns about the intelligibility and coherence of the notion of ontic vagueness can be overcome. Yet this defence of the notion of vagueness in reality might seem somewhat incomplete. “Do we *really* understand the notion of vagueness in reality?” – this seems the question that we still need to address. Indeed, sceptics may argue that, whether or not there are good arguments against its intelligibility, that of vagueness in reality remains an obscure notion, and this is by itself a reason to reject the hypothesis that things themselves might be vague. In this section, my aim is to dismiss this line of thought, which might provisionally be called the “blank stare” argument (cfr. Eklund 2011). To this effect, I will begin with some general considerations about how the debate between defenders and detractors of vagueness in reality ought to be conceived, and then move on explaining why, on the picture of the debate I will be suggesting, the blank stare argument loses much of its dialectical force. I will conclude with some positive remarks about what kind of considerations should be the focus of our philosophical efforts in assessing the question whether there is vagueness in reality.

3.1 Against the blank stare

The basic complaint that I move against the blank stare argument is that it assumes what Sider (2011) calls a *magical-grasp* picture of understanding:

“Philosophers sometimes slip into a magical-grasp picture of understanding. An opponent wields a crucial term. She will not be bullied into equating it with some combination of preferred terms. An inward search for a mystical mental state of

UNDERSTANDING comes up empty. The opponent is pronounced confused or obscure.” (Sider 2011, p. 9)

I am going to argue that, once the magical grasp picture has been abandoned, the question itself whether we *really* understand the notion of vagueness in reality becomes empty or at any rate beyond the point. This puts into question the tenability of the sceptical blank stare.

A somewhat simplified but not unrealistic picture of the debate between defenders and detractors of vagueness in reality would represent them as disagreeing over what kinds of things vagueness can be a property of. According to a traditional conception, vagueness is a property of representations alone; on this view, it makes little sense to say that some states of affairs of the world are vague. Let’s call this the *narrow* conception. According to defenders of vagueness in reality, there is no such ban on what kinds of things can exhibit vagueness: indeed, both representations and things themselves might. Let’s call this the *broad* conception.

How should we adjudicate about which one is the best conception of vagueness? Arguably, the way English speakers ordinarily use the predicate ‘vague’ is irrelevant to settling the dispute. For one thing, it is clear enough that the folk does not master the concept *vague*. One might easily find examples of ordinary discourse where vagueness is confused with affine but distinct properties such as ambiguity or generality (cfr. also Williamson 1994). Nor the folk seems reliable when it comes to saying what kinds of things the predicate ‘vague’ may apply to. Indeed, we hear this predicate applied to a variety of things, including discourses, behaviours, people; it’s hard to say whether we do better justice to them by ascribing them the belief in a broad conception of vagueness or simply an incoherence in the use of the predicate.

Merely reflecting on our concept vague also seems insufficient to resolve the disagreement. Even if we were able to establish, after careful consideration of the issue, that the narrower conception does better in capturing our concept of vagueness, the question would still arise as to whether that is the concept we ought to have in our conceptual repertoire. Indeed, it is entirely possible that the concept we possess is somehow defective or incomplete, perhaps precisely because it is too narrow. Thus it seems that what we should be concerned with is not whether

our concept of vagueness is actually narrow, but rather about whether *a* suitable conception of vagueness ought to be so.

This kind of problem, concerning the suitability of certain concepts of ours, is neither new nor rare in philosophy. Consider, for example, a classic case of disagreement about logic. Professor A supports full classical logic in the face of the Sorites and Liar Paradox. Professor B, instead, prefers a non-classical logic, e.g. a paracomplete logic, which invalidates the law of excluded middle. Since A and B are likely going to disagree about whether ‘p’ and ‘not-not-p’ are logically equivalent, it seems fair to say that they defend different conceptions of negation, i.e. different theories of what ‘not’ means.

Suppose now that Professor A argued against B’s logic on grounds that she fails to understand what Professor B means by negation, since for A, but not for B, ‘not-not-p’ just is ‘p’. How legitimate would be this objection, in the situation given? The objection *could* be legitimate if Professor B didn’t provide the details of her logic, by making it explicit what follows from what on her view. The mere assertion “I don’t think that ‘not-not-p’ implies ‘p’” may well not be enough for A to acquaint herself with B’s view. But the objection wouldn’t seem equally legitimate if Professor B was careful enough in spelling out her logic. Indeed, it seems that Professor A has been given all the elements that are necessary to understand B’s point of view. Granted, A has a different theory of what ‘not’ means, and that might make it difficult for her to understand B’s perspective. Yet A might come to appreciate what B means by ‘not’ by starting “playing around” with B’s logic, seeing what follows from what on her view. Perhaps, she might remain unconvinced by B’s arguments in favour of her view; perhaps she might instead change her mind and decide to embrace B’s logic. In any case, the right way for A to investigate whether classical logic or B’s logic is the true logic is not by wondering from the armchair whether B’s concept of negation is the correct one.

Similar remarks apply, in my view, to the problem of vagueness in reality. Defenders of the ontic view are proposing arguments in favour of a generalized notion of vagueness, which they can’t define if not (maybe) *via negativa*. The burden on them is, of course, to present a theory of

ontic vagueness, specifying the nature and logic of this phenomenon. But once the theory has been presented, is there more room for sceptics to complain that they don't understand the notion of ontic vagueness? I think not. Sceptics who advance the blank stare argument are looking for an illumination, a "mystical mental state of UNDERSTANDING", as Sider (2011) puts it. But there are no such illuminations.

As Sider himself notes, a more realistic account of how we grasp the meaning of newly introduced philosophical notions crucially involves consideration of the theoretical work they accomplish. Indeed, if theoretical work is not at least a guide to understanding, it's hard to see how else we could come to grasp any novel philosophical notion at all. Truly enough, we do sometimes have a pretty immediate understanding of certain novel philosophical notions. Perhaps the notion of a *possible world* may be an example. Yet that is no reason to suppose that our grasp of these notions occurs by way of illumination. A more plausible explanation is that the theoretical work played by these notions is more easily understood.

The suggested explanation of understanding is superior to the magical grasp picture not only in that it avoids a suspicious appeal to magical illuminations. It is significantly more uniform. For even though one might find something like the magical grasp picture plausible for simple notions such as that of a possible world, it's hard to see how the account could be generalized to the more difficult ones (since undoubtedly there are difficult yet perfectly intelligible philosophical notions). Consider, for example, the initially puzzling notions of a possible world *considered as actual* and of a possible world *considered as counterfactual*, often introduced in the context of two-dimensional semantics (cfr. Jackson 1998). It seems implausible to suppose that an illumination of any sort may be behind our grasp of this sort of philosophical concepts. Instead, it is definitely more natural to think that we come to understand these notions by looking at the role they play in the theory (e.g. in the case under consideration, by starting to appreciate the distinction that they intend to track).

The account of understanding that I have suggested in replacement of the magical grasp picture is, of course, only in the form of a sketch. In particular, more work would be needed to

clarify the notion of “theoretical work” to which I am appealing. (To a first approximation, I have in mind something like Lewis’s notion of “role”, as in his account of novel theoretical terms; cfr. Lewis 1970). Here I will just limit myself to clarify that, first, it is not essential to the account I am suggesting that there be any identity between the meaning of a novel theoretical term and its role. I am also not committed to the view that theoretical work is the only way we could come to grasp a certain concept. All I am saying is that appreciation of theoretical work provides at least an indication of meaning, and in this sense it guides understanding.

If the magical grasp picture is replaced in the way I have just proposed, the question whether we can really understand the notion of vagueness in reality, which gives rise to the blank stare argument, dissolves into the question whether this generalized notion of vagueness accomplishes some important theoretical work (e.g., in making room for advantageous doctrines in metaphysics and related fields). If the notion is indispensable, and its role in our theories is relatively clear, then we ought to endorse the generalized notion; otherwise, we ought to side for the narrow one (and take the generalized conception as simply unsatisfied). Therefore, the considerations that become relevant for settling the problem of ontic vagueness in favour of one or the other side of the dispute concern how advantageous having a broader conception of vagueness can be *vis à vis* the possible theoretical costs that this broader notion might have. This is the problem that I think we should focus on in our philosophical endeavours concerning the problem of ontic vagueness.

In what follows, my aim will be to sketch some *prolegomena* to any future debate on the problem of ontic vagueness. In particular, I will present some arguments to the effect that the hypothesis of vagueness in reality makes for an unparsimonious view, when compared to traditional accounts of vagueness. With few exceptions, these arguments have been neglected in the literature, but it is important to raise them here as they play an important role once the problem becomes that of evaluating the costs and benefits of the thesis that reality can sometimes be vague.

3.2 Simplicity and Vagueness in Reality

It is possible to distinguish several arguments purporting to show that the hypothesis of vagueness in reality makes for an unparsimonious view. Here I will concentrate on three of them, which I find particularly significant. These are the arguments from *theoretical conservativity*, *uniformity* and *ideological simplicity*. To clarify, none of these arguments are decisive against the hypothesis of vagueness in reality. For to say that a certain hypothesis is unparsimonious is just to say that, *all other things being equal*, we should not believe in it. The determined defender of the ontic view might still reply that all other things are *not* equal when we fail to recognize the existence of vagueness in things themselves, thus dismissing the argument. Yet the burden remains on them to convince us that this is actually the case.

The first two arguments to the effect that the hypothesis of vagueness in reality is unparsimonious develop an asymmetry between the traditional and the ontic accounts of vagueness. Consider the statement:

- (1) Obama is quite tall.

Arguably, this statement is vague. But it seems implausible to think that the vagueness of (1) is due to the existence of a vague property of *being quite tall*, which Obama instantiates. As Wright (2003) puts this concern:

“[I]t strains credulity to suppose that in our use not merely of basic vague predicates like "tall", but also of vague compounds like "very tall", "unusually tall", "quite unusually tall", and so on, we merely respond to objectively vague properties put up by the world.” (Wright 2003, p. 96)

Thus it seems plausible to think that at least some vagueness is not due to features of the world itself, but rather of our words and concepts. This conclusion may also be thought to be a corollary of Evans' argument against vague identity, as I presented it in section 2.4. For, quite uncontroversially, there are vague identity statements. But, at least on one interpretation, Evans has proved that the indeterminacy in truth-value of a statement of the form $a=b$ cannot be due to

a vagueness in the identity relation. It follows that the vagueness of certain identity statements cannot be ontic in nature.

It must be recognized that defenders of vagueness in reality usually accept the considerations I have just put forward. Indeed, they do not deny that *some* vagueness is due to semantic features of our words and concepts; what they deny is just that *all* vagueness is. Yet it is arguable that this even-handedness puts them in a weaker position than the defender of the traditional account of vagueness. For, first, all other things being equal, reasons of *theoretical conservativity* would have us believe in the traditional account of vagueness because it provides us with a natural extension of what we have reasons to believe about the nature and source of the phenomenon of vagueness, viz. that at least sometimes it is a semantic phenomenon.

Second, all other things being equal, the traditional account has an advantage because it provides a *uniform* account or explanation of the phenomenon of vagueness, one according to which vagueness only comes from semantic features of the words and concepts we employ, and not also from the world itself. The picture of vagueness that defenders of vague objects provide is instead that of a *multiform* phenomenon: more than just being a feature of our words and concepts, it is also an inherent feature of the world we inhabit. Since uniformity is a virtue of an explanation, it follows that, all other things being equal, we ought to prefer the traditional account of vagueness⁸.

I anticipate a couple of responses from advocates of the ontic view. Against the argument from theoretical conservativity, a defender of the hypothesis of vagueness in reality might defend the view that belief in vague objects, properties or states of affairs is somehow implicit in us. That would show that the ontic view fits better with what we already believe about the source of the phenomenon of vagueness. However, I know of no extended discussion on this issue in the literature. It is not uncommon to find defenders of the ontic view claiming that the explanation of a certain case or phenomenon, which appeals to the existence of vagueness in

⁸ Eklund (2008) proposes an argument against the hypothesis of vagueness in reality based on the assumption that vagueness is a uniform phenomenon. However, it is hard to see how Eklund's argument does not merely beg the question against defenders of the ontic view. My appeal to uniformity only serves the purpose of demonstrating that we should not believe in the ontic view all *other things being equal*.

things themselves, is more “intuitive” or “natural”, but that does not show that belief in ontic vagueness in reality is implicit in us. Further work would be required to adopt this strategy of response.

Against the argument from uniformity, it may be replied that it is simply not true that the ontic view depicts vagueness as a multiform phenomenon. In fact, it is arguable that, our language and thought being part of reality, there are no other sources of vagueness, according to this view, apart from reality itself. The problem with this response is that it equivocates the sense of “reality” that is at issue here. Clearly words and concepts are *things*. But it would be misleading to argue that, since most words and concepts are vague, there is vagueness in reality. This sense of ‘reality’ is clearly not the one that is at issue. What we mean when we ask whether there is vagueness in reality is whether there is vagueness in things *other than* language and thought. On this reading of “reality”, the response that denies multiformity is simply incorrect.

A more sophisticated argument to the effect that positing vagueness in reality makes for an unparsimonious view has to do with the place that this thesis occupies in our best theory of the world. How would defenders of ontic vagueness “write the book of the world” (Sider 2011)? In other words, how would they describe what the world is fundamentally like? Arguably, defenders of vagueness in reality are committed to the claim that a correct and complete description of reality cannot overlook facts about the world’s inherent vagueness. But in order to express truths about the world such as “it’s not determinate where the boundaries of Kilimanjaro lie”, they would need to introduce a determinacy operator “it is determinate that..” into the language of their fundamental theory. This means that the ontic view of vagueness commits one to the claim that our best theory of the world must include, among the set of primitive notions employed by the theory (what Quine (1951) called its *ideology*), a determinacy operator.

Suppose now that the existence of vagueness in reality is our only reason to think that there is metaphysical indeterminacy, i.e. the general phenomenon of unsettledness (of which vagueness in reality, if it existed, would be an instance) that comes from the world itself and

results in there being no fact of the matter as to whether certain statements are true or false. Under this assumption, how would defenders of the traditional account of vagueness write the book of the world? Advocates of this view believe that vagueness is only a matter of our semantic indecision, not a fundamental aspect of the world. Therefore, they would not need to include a determinacy operator into the ideology of their best theory of the world to describe the ultimate shape of reality. (That doesn't mean that they can't introduce a determinacy operator in non-fundamental languages; e.g. when doing semantics). It follows that reasons of *ideological simplicity* would favour their fundamental theory over the one that defenders of the ontic view would support.

In response to this argument, one might correctly note that it relies on the uncharged assumption that the existence of vagueness in reality is our only reason to assume that the world may be metaphysically indeterminate. But some philosophers believe that the existence of metaphysical indeterminacy is shown by contemporary physics (cfr. Darby 2010). Indeed, on some interpretations of quantum mechanics, the world may be thought not to settle the matter about whether a given particle is located in a certain spatio-temporal region or not, so as to give rise to cases of metaphysical indeterminacy. Philosophical considerations may provide another reason to believe that the world is not fully determinate. Statements about the future, for example, may produce other instances of metaphysical indeterminacy, if it's true that the future is metaphysically (and not only epistemically) open, so that statements about future contingent state of affairs are neither true nor false (cfr. Barnes and Cameron 2009). For this reason, I must admit I am genuinely not sure whether the argument from ideological simplicity holds in the end. I don't have arguments either in favour or against the view that there exist other forms of metaphysical indeterminacy which are not the result of ontic vagueness. But since the existence of metaphysical indeterminacy is still an open issue, at least the argument from ideological simplicity provides a *prima facie* reason not to commit to the idea of vagueness in reality if it is not necessary.

To sum up the results of the discussion in this section, I have argued that the problem whether we can really understand the notion of vagueness in reality is based on a misguided conception of understanding – the magical grasp picture. Once this conception is replaced with a more plausible account of understanding, the relevant issue that remains to be settled concerning the notion of ontic vagueness is simply whether it can accomplish some important theoretical work. Finally, I have given reasons to think that endorsing the broader conception of vagueness advocated by defenders of the ontic view has a cost in simplicity, in that it leads to a less uniform explanation of the phenomenon of vagueness and, at least plausibly, to less parsimonious metaphysical theories. The crucial question now is whether the hypothesis of vagueness in reality can compensate this apparent cost in terms of simplicity by making room for a more satisfactory theory of the world than any defender of the semantic account can possibly achieve.

4. Are Vague Objects Indispensable?

In the previous section, I have argued that the question we should be concerned with in our philosophical investigation on the problem of ontic vagueness is whether positing vagueness in things themselves, as opposed to just in our words and concepts, makes for theoretically advantageous theories of the world. I have also presented some arguments to the effect that, all other things being equal, we should not be tempted to posit any vagueness in things themselves, but rather stick to the simpler hypothesis of vagueness as a semantic phenomenon. In this section, I will focus on the question whether there is any theoretical advantage at all in positing vagueness in things themselves.

My discussion here will be restricted in two ways. First, I will only discuss possible sources of evidence for the existence of vague objects (hence, I will not take up the question whether we should believe in vague properties or relations). Also, I will concentrate on a particular argument that is often used to support the hypothesis that there exist vague objects, according to which vague objects are needed to solve a famous metaphysical puzzle proposed by Unger

(1980), the “problem of the many”. I take this to be one of the most important argument in the literature in favour of the hypothesis of vague objects. I am going to show that the argument fails in an instructive way: indeed, rather than providing a reason for positing vague objects, it actually provides a reason against doing so.

4.1 The Problem of the Many

The problem of the many challenges our beliefs about the existence and nature of common macroscopic objects. To illustrate, consider cat Tibbles, who is alone on the mat. It seems unclear what collection of particles is the collection of all and only the particles that compose Tibbles in this moment. Indeed, a great variety of cat-shaped aggregates of particles, differing at the borders ever so slightly one from each other, seem able to serve the role of referent of our name ‘Tibbles’ equally well. Since all these “Tibbles-candidates” have an equal claim to be a cat, if one of them is a cat, the others must be cats too. Hence the dilemma: either all these Tibbles-candidates are cats, or no one is.

The dilemma is hard to escape. As Unger (1980) notes, it won’t solve the problem simply to insist that two or more things occupying roughly the same space at the same time cannot satisfy the predicate ‘is a cat’ together. This, Unger says, is merely an “Exclusion Principle”. Given the multitude of Tibbles-candidates, it ensures that *at most* one of them is a cat. But it is silent about whether *at least* one of them is. Indeed, it is arguable that this principle only encourages the conclusion that there is no cat on the mat. For one thing, the principle does nothing to deny that the aggregates of particles on Tibbles’ mat equally deserve to be cats. Hence it does not reject the claim that, if one Tibbles-candidate is a cat, the other, equally deserving, candidates must be cats too. But if it’s true that the presence of one cat entails the presence of many cats, as Unger contends, the only option compatible with the principle that there is *at most* one cat on the mat is that *no* cat is on the mat.

What is needed to defend the thesis that there is exactly one cat is a principle of an entirely different sort, which Unger called a “Selection Principle”. Any such principle would single out exactly one Tibbles-candidate among the many as the best candidate to deserve the title of ‘cat’. The trouble is that providing a true Selection Principle seems beyond our possibilities. Consider, for instance, the following situation. Hair *h* is not firmly attached to Tibbles, yet not completely detached. Call ‘Big’ the cat-like aggregate made up of all the particles of Tibbles including *h*, and ‘Little’ the difference of Big and *h*. There seems to be nothing in our usage of the name ‘Tibbles’ or in the morphology of the cat that determines whether Tibbles is identical to Big or Little. Thus, for any good reason to think that Big is a cat, there seems to be an equally good reason to think that Little is a cat. The problem, therefore, is that there seems to be no non-arbitrary way of selecting one of Big and Little as the cat on the mat.

One could try, at this point, to concede that there is no true, non-trivial Selection Principle to be provided, and still insist that it is a fact – a brute fact – that there is exactly one cat on the mat. Markosian (1998), for example, defends a view called ‘*Brutality of Composition*’ defined as follows:

BC: When some objects compose a larger thing, it is a brute fact that composition occurs (where *F* is a brute fact=df *F* is a fact and it is not the case that *F* obtains in virtue of some other fact or facts).

BC allows him to say that, by a brute fact, there is only one thing that the particles on Tibbles’ mat compose. No principle is therefore required to select a Tibbles-candidate on the mat, since, by a brute fact, there is only one candidate to be selected.

Not many philosophers find the brutalist response attractive, for reasons that are not valueless (cfr. Horgan 1993, Sider 2001). If it is true that there is exactly one cat on the mat, why does *that* particular arrangement of particles constitute a cat, whereas another, extremely similar arrangement does not constitute anything at all? The brutalist responds that there is no informative answer - it is a brute fact. But this seems more of an evasion from the problem than an adequate resolution of it. The scientific enterprise would have come to an end a long ago if

we had been allowed to posit brute facts wherever we had found it difficult to come up with suitable explanations. We should be no less demanding in metaphysics. Thus, it is hardly a satisfactory response to Unger's dilemma that our common beliefs about ordinary macroscopic objects are correct but there is no saying why.

But if we can't appeal to brute facts, how else can we regain the familiar world of ordinary material objects? A recurrent theme in the recent literature has been that the hypothesis of vagueness in reality helps providing a resolution of Unger's problem (Van Inwagen 1990, Johnston 1992, Morreau 2002, Wilson 2013). According to defenders of this view, the problem of the many arises because philosophers haven't paid enough attention to the nature of ordinary material objects. They have been assuming that names for ordinary objects like 'Tibbles' purport to refer to aggregates whose set of particles is completely determinate. This is a pretty standard assumption to make when we think of vagueness as merely a deficiency of our language and thought: whereas most of our words and concepts are vague, the world that they help describe is fully precise. But once one accepts the idea that that things like cats are precisely bounded objects, one gets into trouble: many things with slightly different borders seem equally good candidates to be what we refer to with our name 'Tibbles'; thus, either all these things are cats, or no one is.

This common assumption that ordinary material objects are fully precise aggregates of particles strikes defenders of vagueness in reality as implausible. In their view, it is sufficiently clear that what we refer to when we talk about Tibbles is not a precisely bounded aggregate of particles, but rather a vague object, an entity whose boundaries are not fully determinate. How exactly we should conceive of these entities with indeterminate boundaries is a disputed matter. Perhaps the most natural way is think of them as having fuzzy boundaries (Van Inwagen 1990). On this account, the relation 'being part of' is a matter of degree. Thus some particles can be part of Tibbles to degree 1. Others may belong to it to degree 0. Still other particles can be part of Tibbles to an intermediate degree, without there being no correct answer as to whether they

are really part of Tibbles or not. We might call this the *degree-theoretic* account of vague objects.

Two more pictures are worth mentioning. Some philosophers conceive of vague objects as entities that admit of *sharpenings* or *ontic precisifications* (Morreau 2002, Akiba 2004, Williams 2008). If, for example, it is vague whether hair *h* is part of Tibbles or not, then there is a precisification of Tibbles (i.e. a cat-like aggregate of particles) which has *h* as its part, and a precisification of Tibbles which doesn't have *h* as its part. The vagueness of our cat consists in Tibbles not being identical with any of these precisifications (or 'approximations' or 'determinations')³. This might be called the *precisificational* account. A third picture is provided by those theorists who distinguish between an object and its matter, and claim that Tibbles is a vague object in the sense that it is vague which precise aggregate of atomic particles *constitutes* it. On this account, there is a host of precise aggregates of particles in the vicinity of Tibbles, all having an equal claim to be the collection of particles that makes up (or "constitutes") our cat, and it's indeterminate by which of these possible Tibbles-constituters Tibbles is made up. We might call this the *constitution* account (Johnston 1992)⁹.

We need not decide which of these accounts provides the best picture of vague objects. The important thing in the present context is that these accounts make room for a common strategy of response to the problem of the many. As I have presented it, Unger's puzzle arises from the apparent impossibility of selecting one aggregate of particles among the many as the one cat on the mat. But if things like cats are vague objects, we need not select one of these aggregates. For the only thing that has a claim to be cat Tibbles is the object with vague boundaries; the many precisely bounded aggregates of particles that Unger takes to be perfectly good candidates to be cats are, at best, only alternative precisifications or constituters of Tibbles. Thus the argument for the many cats cannot get off the ground. Is this response successful against Unger's

⁹ Someone might protest that it is incorrect to talk in terms of vague objects on the degree-theoretic and constitution account, since what are really vague on these pictures are the relations of parthood and constitution. But 1) what I am concerned here is a general strategy of positing vagueness in reality itself to overcome Unger's problem, no matter exactly where the vagueness is posited; 2) it is standardly assumed that the notion of a vague object can be defined derivatively upon the notion of parthood or constitution being vague (cfr. Eklund 2008).

problem? In 4.2 and 4.3, I am going to raise some worries. It will turn out that defenders of vague objects have been far too optimistic about the adequacy of their solution to the problem of the many.

4.2 Lewis's challenge

A first problem for the solution that appeals to vague objects (in particular, for the precisificational and constitution account) was devised by Lewis (1993), who argued that the idea that Tibbles and other material objects are vague does not prevent a new problem of the many to arise. Suppose, he said, that it's true that Tibbles is a vague object which has cat-like aggregates of particles as its precisifications. It still seems a sensible thing to ask why these precisifications of Tibbles cannot be cats. Lewis argued that there is no reason to suppose that they cannot:

“The cat-precisifications are too cat-like [...], not just in what they can do and how they can be at a moment, but also over time. They would make good pets—especially since 1001 of them will not eat you out of house and home!” (Lewis 1993, p. 105)

A similar problem arises on the constitution account of vague objects:

“The constituters are cat-like in size, shape, weight, inner structure, and motion. They vibrate and set the air in motion - in short, they purr (especially when you pat them). [...]” (*ibidem*, p. 104)

Since there is no reason to assume that the precisifications or constituters of Tibbles cannot be cats, Lewis inferred that the solution that appeals to vague objects does not prevent from the conclusion that there are many cats on the mat, the cat Tibbles and the cat-like aggregates in the vicinity.

How could defenders of vague objects respond? Since Lewis's problem does not seem to arise on the degree-theoretic account, an option would be to embrace this picture of vague objects. However, I believe that defenders of the precisificational and constitution account need

not give up so easily. Here I am going to suggest a plausible response to Lewis's challenge on their behalf. Let's start with the precisificational account. Here the challenge is to show that the presence of the vague cat Tibbles can prevent its precisifications from satisfying the predicate 'is a cat'. Lewis warns against one tempting response:

“Don't say that the precisifications cannot be cats because cats cannot be precise objects. Surely there could be cats in a world where nature is so much less gradual that the problem of the many goes away. It could happen that cats have no questionable parts at all. [...] So, it is at least possible that cat-like precise objects are genuine cats.” (*ibidem*, p. 105)

But Lewis neglects an important possibility. A defender of vague objects may in fact concede that the precisifications of Tibbles *could* be cats, because it is possible that we live in a world where everything is precise, but they might also insist that the vague object Tibbles is *actually* a better candidate to be a cat than any of the cat-like entities in the vicinity. Since what is at issue here is what falls under the predicate 'is a cat', a theory of meaning can be employed to substantiate this proposal. In particular, defenders of vague objects might appeal to a theory that Lewis himself endorsed, according to which the reference-fixing facts relative to a certain term are determined by a combination of our *use* and internal dispositions together with the features of the object or property that counts as its referent – in other words, by “intrinsic eligibility” (Lewis 1983). This is the *best-candidate* theory of meaning.

With this theory of meaning in play, three options are available to defenders of vague objects. They might argue that the vague cat Tibbles is a better candidate than any of the precise aggregates in the vicinity to be a cat. This would be to grant the vague object some kind of *metaphysical* privilege based on its intrinsic eligibility (the terminology is from Sider 2001). Or they might argue that the vague cat is a better candidate than any of the precise aggregates in the vicinity to serve the role of referent of 'Tibbles', in that it fits better with our use. This would be to grant the vague object a kind of *semantic* privilege. Finally, they might argue that the vague cat is both metaphysically and semantically privileged.

I don't know how best to argue for the first and the third option, but it's not unlikely that some defenders of vague objects may find these ways plausible. Surely an argument for the second option is easily available. It would seem, for example, that our usage of the term 'Tibbles' does not determine whether some hairs are part of the cat or not. Therefore, it would seem that a vague object, if there is any, would come closer to fit with our usage of the name 'Tibbles' than any of the precise quantities of matter in the vicinity. Thus the vague object can be plausibly attributed semantic privilege over its precisifications. This, in turn, implies that the vague object has a better claim to be a cat than any of its precisifications.

Someone might protest at this point that Lewis's challenge has not been met yet. "Granted", one might think, "the vague cat-candidate is in a privileged position to be a cat; but this doesn't show that the less privileged cat-candidates are not cats". However, at this point the defender of vague objects has an easy rejoinder. In order to show that the precise cat-candidates in the vicinity of Tibbles do not satisfy the sortal 'being a cat', they can appeal to a simple Exclusion Principle, such as: two or more things cannot occupy nearly the same space at the same time and satisfy the predicate 'is a cat' together. Indeed, having already shown that the vague object Tibbles is the best candidate to be the cat on the mat (in other words, having already provided a "Selection Principle" for determining which entity is the one cat on the mat), this simple Exclusion Principle is all they need to respond to Lewis.

A similar strategy is available to defenders of the constitution account of vague object. For example, the defender of the constitution account might argue that the cat-constituters have different modal profiles from the cat they constitute: whereas the former do not survive to the loss of some parts, the vague cat does¹⁰. Hence it seems that the vague object is a better candidate to be a cat than any of its constituters (cats do survive the loss of some marginal parts!). Moreover, when asked why is it the case that the constituters are not cats, defenders of the constitution account may plausibly argue that there is at most one cat in any situation where there is at least one, thus providing a response to Lewis's challenge.

¹⁰ Johnston (1992) points at this solution when he claims that we count something as being a cat only if it is "*of the right category*" to be a cat, "*i.e. is not a mere quantity or piece of matter*".

Of course, at this point the best-candidate theory of meaning that I have proposed on behalf of defenders of vague objects may be rejected on independent grounds. Here I shall not investigate further, since, as I shall argue in the next section, defenders of vague objects have a more serious and alarming problem to cope with than defending the best-candidate account.

4.3 Unger's challenge

A second problem for the solution that appeals to vague object was put forward by Unger in his seminal paper on the problem of the many (1980). Suppose, he said, that Tibbles is a vague object, and h is one of its not-firmly-attached hairs. Now consider the object Tibbles*, which is exactly like Tibbles with the exception that h is definitely a part of Tibbles*. The problem of the many can be reinstated. For Tibbles and Tibbles* are both vague objects. Moreover, there seems to be nothing that makes Tibbles a better candidate to be a cat than Tibbles*. Thus if Tibbles is a cat, Tibbles* must be a cat too. It follows that, if Tibbles is a cat, there are at least two cats on the mat. Too many.

Faced with this objection, defenders of the vague-object solution have often responded by denying that there can be such thing as Tibbles*. In his *Material Beings*, for example, Van Inwagen (1990) pointed out that the activity of the particles of Tibbles* does not constitute a life. As Van Inwagen believes that the only material objects that exist are living organisms, he concluded that Tibbles* does not exist. There was, for him, only one living thing on the mat: the vague object Tibbles. However, I shall argue that this response underestimates the force of Unger's challenge. In particular, I shall argue that, unless one embraces some form of brutalism concerning vague objects, the claim that Tibbles* does not exist is not justified.

Let's start by looking carefully at what Van Inwagen says in his *Material Beings*. Here's a relevant passage:

“[The particles of Tibbles*] do not compose [anything] owing to the fact that their activity does not constitute a life. Their activity does not constitute a life because there is only one life that any of them is caught up in”. (Van Inwagen 1990 p. 225)

He then considers the obvious response to this argument:

“But why should the friends of the many grant you this unique life? Why should one not suppose that any life is more or less conterminous with an enormous number of more or less similar events, each of which is a life?” (*ibidem*)

Indeed, one might argue that there is nothing that prevents the particles of Tibbles* from constituting a life, since the particles of the vague cat Tibbles do. But, according to Van Inwagen, this would be “a desperate move”. Think of a riot:

“[Consider] Alice, who stood about on the outskirts of the mob and who shouted a few slogans [...] and left as soon as she heard sirens. Consider the people other than Alice who took part (to whatever degree) to the riot. Had they a special riot of their own [...]? It seems to me that we should require some very good reason to believe that there was any event of that description. I think that we have no such reason.” (*ibidem*, pp. 226-7)

But what Van Inwagen’s example actually shows is that there is a problem of the many for events like riots just as there is a problem of the many for objects like cats¹¹. If it’s indeterminate whether Alice was part of the riot or not, then it’s indeterminate whether the other people in the riot had a special riot of their own or had a riot with Alice. And just as there is no good reason to believe that there was any event like a riot*, i.e., a riot without Alice, there is no good reason to believe that there was any event like a riot in the first place. This is, after all, Unger’s puzzle with which we began.

It may be objected here that my last argument relies on an abundant (and very objectionable) ontology for events, one in which there can be such things as lives* and riots*, whereas Van Inwagen is pushing towards a sparser (and more plausible) ontology for events. But the objection would miss the point. When Van Inwagen claims that there can be only one life or only one riot at a given place and time, he is proposing an Exclusion Principle concerning

¹¹ Cfr. Hudson 2001 for a similar claim.

events like lives and riots. But, as suggested in section two, it is compatible with the fact that two lives or riots cannot occur in roughly the same place at the same time that *no* lives or riots ever took place. What Van Inwagen also needs is a principle that *selects* one among the many plausible candidates for constituting a life or constituting a riot the unique candidate to constitute a life or a riot. In the case of our cat, he also needs to specify a set of properties that Tibbles have and Tibbles* doesn't in virtue of which the activity of the particles of Tibbles constitutes a life, whereas the activity of the particles of Tibbles* doesn't. Without such a Selection Principle, Unger's challenge is not overcome.

The argument that I have just put forward against Van Inwagen's theory can be generalized to any solution that appeals to vague objects. Notice, first of all, that Unger's challenge arises whatever our preferred account of vague objects is. On the degree-theoretic account, we can think of Tibbles* as an object whose particles are exactly the same as Tibbles, with their degree of parthood being distributed in exactly the same way, except from one hair, *h*, which belongs to Tibbles to degree 0.5 and to Tibbles* to degree 1. In the case of the precisificational account, we can think of Tibbles* as composed of exactly the same particles as Tibbles, with the exception that all Tibbles*'s precisifications have *h* as their part, whereas Tibbles has at least one precisification that lacks hair *h*. Finally, on the constitution account, we can think of Tibbles* as an object constituted by exactly the same aggregate of particles that makes up Tibbles, with the exception that Tibbles* has no constituter which lacks hair *h*, whereas Tibbles has at least one.

In any case, the question that defenders of vague objects need to answer is: why is it the case that Tibbles, rather than Tibbles*, is the cat on the mat? Merely to insist that Tibbles* does not exist (perhaps because the activity of its particles does not constitute a life) is not enough: for the question would then arise as to what grounds the fact that Tibbles exists in the first place. What I am asking, in other words, is a suitable Selection Principle that could guarantee that Tibbles is the cat on the mat without also allowing that Tibbles* could be a cat. I am now going to argue that the only way defenders of vague objects have to provide such a principle is to

embrace some form of brutalism concerning vague objects. This conclusion is based on a simple argument by elimination.

Can the defender of vague objects argue that Tibbles is *semantically* privileged over the vague objects in the vicinity to satisfy the predicate ‘is a cat’? I think this would be a hopeless attempt. For this response to work, it must be assumed that our thoughts and practices could be so sensible so as to single out, up to the smallest particle, a particular vague object in the world¹². This seems just incredible¹³. As McGee and McLaughlin (2000) note as regards to the degree-theoretic account:

“For [‘Tibbles’] to refer to a uniquely determined vague object, our usage of the word would have to fix a precisely delimited inner border separating atoms that are parts of [Tibbles] to degree 1 from those that are parts to a lesser degree, a precisely delimited outer border, separating atoms that are parts to a positive degree from those with degree 0, and a uniquely determined function assigning precise numerical values to the atoms in between. For our usage to pick out a uniquely determined vague object would be even harder than picking out a uniquely determined precise object.” (McGee and McLaughlin 2000, p. 131)

Further, even if, against the evidence, the defender of vague objects were to bite the bullet and claim that there is something about Tibbles that makes it the best candidate to be the cat on the mat, I would then question the motivation for believing in vague objects. Of course, we could have bitten the bullet in the original presentation of Unger’s problem, when asked to select one of many precise Tibbles-candidates. We could have argued that our thoughts and practices pick out one of these candidates as the determinate referent of our name ‘Tibbles’. But if this is the strategy that we have to adopt to solve Unger’s problem, there is no need to add vague objects to the story. Thus defenders of vague objects should not embrace the claim that Tibbles is semantically privileged over Tibbles*.

¹² I am here using the expression ‘thoughts and practices’ as in McGee and McLaughlin 2000, to indicate whatever exactly contributes to fixing the reference of our terms and predicates.

¹³ The complaint here parallels the “incredulous stare” argument that is often moved against advocates of Epistemicism (cfr. Williamson 1994 for discussion).

The only alternative is to say that Tibbles is *metaphysically* privileged over Tibbles* to be the cat on the mat. But it is a short step from here to conclude that this privilege must be grounded on nothing. By construction, Tibbles and Tibbles* differ from each other for a single hair. As they share all the relevant properties to be cats, for any good reason to think that Tibbles is a cat, there is an equally good reason to think that Tibbles* is a cat. Thus:

- 1) There is no property or set of properties which form the basis of Tibbles being a better candidate than Tibbles* to satisfy the predicate 'is a cat'.

But defenders of vague objects are also committed to the truth of:

- 2) It is a fact that Tibbles is the cat on the mat.

Now recall that something is a brute fact just in case there is nothing in virtue of which it obtains. From 1) and 2), it follows that

- 3) It is a *brute* fact that Tibbles, rather than Tibbles*, is the cat on the mat.

What 3) shows is that defenders of vague objects are committed to the claim that it is a brute fact that Tibbles is the one and only cat on the mat (thereby excluding Tibbles* from being a cat – and, on a view like Van Inwagen's, from *existing*). Now, I am not suggesting that this assumption is false. But there are at least two problems in this appeal to brute facts. First, it shows that the idea that there are vague objects is by itself *explanatorily insufficient* to solve the problem of the many. In order to solve Unger's problem, defenders of vagueness in reality need not only to assume that there exist vague objects over and above the precise quantities of matter that common metaphysical doctrines recognize, but, most significantly, they need to posit an arbitrarily large number of brute facts in the world in virtue of which these objects come in and go out of existence. Secondly, the brutalist assumption makes the appeal to vague objects *redundant*. Suppose we accept Markosian's (1998) claim that the problem of the many must be solved by appealing to an arbitrary number of brute facts in the world. Then why also posit vague objects? It seems that the brutalist assumption alone can provide a solution to the problem of the many. If that is the case, then there is no need of vague objects.

4.4 Objections

A number of objections can be raised to the previous arguments. Here I shall discuss three of them that I find particularly pressing.

1) *Can we single out Tibbles*?*

My argument against defenders of vague objects relies on the assumption that, once we grant that there is a vague cat on the mat, say Tibbles, it is possible to think of a slightly different cat, Tibbles*, which appears to be as good as a candidate for being the cat on the mat as Tibbles. But some defenders of vague objects may deny that this is possible. If Tibbles is *really* vague, they might argue, we cannot even *think* of a slightly different cat in the vicinity of Tibbles. Thus, if Tibbles is really vague, the assumption on which my argument relies is not warranted. It is true that my argument relies on the assumption that we can make sense of there being an object Tibbles* slightly less vague than Tibbles in the vicinity of our cat. But the assumption is warranted on any of the three conceptions of vague objects that I have presented. On the degree-theoretic account, there exists a function that maps the single particles of the vague cat Tibbles to a number in the real interval $[0, 1]$, such that, given any particle x , the function gives us as output the degree to which x is part of Tibbles. But of course there is a huge number of functions mapping a finite set of objects to the real interval. It is therefore possible to make sense of an object whose particles are mapped to $[0, 1]$ in a slightly different way. So my assumption holds on the degree-theoretic account.

The assumption also holds on the precisificational and the constitution account of vague objects. The reason is that, on both accounts, cat Tibbles is understood as an object that has: at least some clear components or constituents (say, some firmly attached hairs), at least some clear non-components or constituents (objects which are not part of Tibbles), and at least some unclear components or constituents (some not-firmly-attached hairs)¹⁴. It is then possible to

¹⁴ It is also not essential to my argument that there must be a sharp line of demarcation between clear and unclear components of Tibbles. Perhaps the boundary between what counts as a clear part of Tibbles and what counts as a questionable part is itself vague. But that does not threaten the argument. What is required to raise the problem is only that there are *some* clear components and *some* unclear components.

consider slight variations in this distribution of clear and unclear components or constituents. In particular, a variation in the clear components or constituents will produce a new object, which is definitely distinct from cat Tibbles. One such object is what I named ‘Tibbles*’.

So, if defenders of vague objects want to reject the idea that we can think of such objects as Tibbles* in the presence of the vague cat Tibbles, they must deny that the three accounts I have been working with provide an adequate representation of what a vague object is. But what could be a good alternative? Let me here advance a proposal on their behalf. Let’s say that an object is *really* or *utterly* vague if there is no way of telling, of *any* component, to what degree they are part of the object. On this picture, the idea that there might be an object Tibbles* definitely distinct from Tibbles seems unintelligible. For, given any particle x in the vicinity of Tibbles, there is no way of insisting that there might be an object Tibbles* which differs from Tibbles for at most particle x , since it is unclear whether x is part of Tibbles in the first place. So Unger’s argument for the many cats cannot get off the ground.

Although I grant that this might be a way of responding to Unger’s problem, I think the prospects for this new conception of vague objects are slim. First, the idea that common material objects are utterly vague appears to lack independent motivation. On this picture, it seems that we should reject the determinate truth of some uncontroversial statements such as that Tibbles’s heart is a part of Tibbles. Also, a number of important worries might be raised, for example, concerning the identity conditions of these utterly vague objects. Evaluation of these issues must await for specific proposals. For the present purposes, I will regard the hypothesis of utterly vague objects as too byzantine to be given serious consideration.

2) *Almost-Identity?*

I have assumed that defenders of vague objects would be willing to deny that there are such things as Tibbles* in the vicinity of Tibbles (and then I have argued that they can do this only under the brutalist assumption). But perhaps I was too quick. Perhaps, some defenders of vague

objects may accept that there are such things as Tibbles* in vicinity of Tibbles, and still deny that there are two cats on the mat. The most promising suggestion that I can think of is inspired, once again, by the work of David Lewis. In a footnote of his (1993), Lewis discusses the possibility of an object being vaguely identical to another:

“If there are vague objects, no doubt they can be in a relation of ‘vague identity’ with one another. We might think that when a and b are vaguely identical vague objects, the identity statement $a=b$ suffers a truth-value gap; but in fact this conception of vague identity belongs to the theory of vagueness as semantic indecision. As Gareth Evans showed, it doesn’t mix with the idea that vague identity is due to vagueness in nature. [...] Even if $a = b$ is definitely false, a and b can still be ‘vaguely identical’ in the sense of sharing some but not all of their precisifications.” (Lewis 1993, p. 170)

Evans (1978) proved that defenders of vague objects could not consistently hold true a statement of the form “It is indeterminate whether $a=b$ ”, where ‘ a ’ and ‘ b ’ are precise names standing for vague objects (cfr. section 2.4). But, Lewis suggests, even though $a=b$ is determinately false, a and b can still be in a relation of “vague identity” in a weaker sense, “in the sense of sharing some but not all of their precisifications”.

The suggestion for defenders of vague object is then as follows. Consider Tibbles and Tibbles*. It seems possible to argue that Tibbles and Tibbles* are “vaguely identical” in the sense that they overlap significantly in their precisifications. Moreover, it seems possible to say that, since Tibbles and Tibbles* are “vaguely identical” in this sense, they are *almost* one and the same cat. Finally, defenders of vague objects may embrace Lewis’s (1993) idea that:

“The cats are many, but almost one. By a blameless approximation, we may say simply that there is one cat on the mat. Is that true? - Sometimes we’ll insist on stricter standards, sometimes we’ll be ambivalent, but for most contexts it’s true enough.”(*ibidem*, p.113)

Is the proposed solution convincing? Some people find the idea of almost-identity as applied to the problem of the many attractive. I’ll confess I am not one of them. My reason is this. Even if Tibbles and Tibbles* are almost-identical, it is still the case that they are definitely distinct. It

may well be the case that, in ordinary circumstances, counting things by almost-identity will be enough for our purposes, but this doesn't rule out the fact that, when we count things by classical identity, as we sometimes do, it will be true that there are several vague cats on the mat where we see only one. I don't claim this to be a refutation of the idea of almost-identity, but at least a good reason not to be happy with it.

3) Rejecting Redundancy?

I have argued that the appeal to the brutalist assumption makes the vague objects solution redundant. A defender of vague objects might respond that, although it is true that the hypothesis of vague object is sufficient to solve Unger's problem, the combination of this hypothesis with the brutalist assumption makes for an appealing view concerning the nature of material objects. Further, they might argue that this view is superior to Markosian's Brutal Composition theory; for this reason, they might conclude, my redundancy claim fails: we need both vague objects and the brutalist assumption.

My first reaction to this argument would be to deny that the appeal to brute facts in the world makes for an attractive view concerning the nature of material objects. But let this pass. Suppose that I grant that we need the brutalist assumption. What extra theoretical work can the hypothesis of vague objects do that a brutalist theory like Markosian's cannot do? After all, a central motivation behind Markosian's Brutal Composition is the concern of preserving common ideas about the nature of material objects (in particular, of the conditions under which two objects compose a larger thing; cfr. Markosian 1998). Some possibilities are in order.

Perhaps one thought might be that Markosian's theory cannot account for the intuitive vagueness in the relations of parthood and composition. Some people might find it plausible to think that there are particles in the vicinity of Tibbles that are part of the cat only to a certain degree. But notice that the combination of this idea with the brutalist assumption has extremely counterintuitive consequences. An argument that is often advanced against the Brutal

Composition view is that it makes the existence of common macroscopic objects “unbearably fragile” (Hawley 2004; cfr. also Sider 2001, p. 124). As Hawley puts it:

“[I]f this object had been ever so slightly different then its proper parts just would not have existed, and if this plurality had been ever so slightly different, then its sum just would not have existed (other things being equal, that is).” (Hawley 2004, p. 393)

But this fragility is even more remarkable in the case of objects with fuzzy boundaries. If some hairs of Tibbles didn't belong to it to degree 0.5, but only to a slightly lesser degree, Tibbles would not have been a cat. This extreme fragility of vague objects is counterintuitive. Therefore, I doubt that integrating a brutalist picture with the hypothesis that the relation of parthood and composition are vague makes room for a more attractive view than Markosian's concerning the nature of material objects.

The best argument against my redundancy claim that I can think of is available only to defenders of the constitution account of vague objects. Markosian's theory, they might say, allows for brute facts at the level of composition (in that he endorses the view that it is a brute fact that composition occurs in some cases). But on the constitution account of vague objects, there is no need to embrace *this* form of brutalism. For it is compatible with this account that Unrestricted Composition is true, and therefore, given any set of particles, there is another thing (a mere “piece of matter”) that these particles compose. What defenders of the constitution account would need is only brutalism at the level of *constitution*, namely the view that, whenever a mere piece of matter constitutes an object, it is a brute fact that this occurs.

The problem with this response is that it is difficult to assess whether the fact that constitution theorists need the brutalist assumption only at the level of constitution puts them in a better position than Markosian. The issue, I think, is going to largely depend on whether we accept the thesis of the non-identity of objects and their matter, supported by defenders of the constitution account (cfr. also Fine 2003). Assessing this issue would require a separate work. I therefore leave it as an open question whether, even in the case of the constitution account of vague objects, it is possible to overcome the redundancy claim.

5. Conclusion

Is there vagueness in reality? In the first three sections, I have argued that the traditional worries about the intelligibility and coherence of vagueness in reality are unfounded or, at any rate, undecisive. Yet the considerations of section four suggest a moderate scepticism about the existence of vagueness in things themselves. In particular, one of the main arguments in support of this hypothesis has been shown to fail quite dramatically. Rather than providing an appealing solution to Unger's problem of the many, defenders of the ontic vagueness solution seem to have a hard time demonstrating that the appeal to vague objects is not completely redundant. This seems to give some plausibility to the idea that we shouldn't believe in the unparsimonious hypothesis of ontic vagueness.

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IS THERE A FUNDAMENTAL LEVEL?

1. *Fundamentalism*

Many philosophers and scientists are inclined to endorse a *fundamentalist* conception of the structure of reality. As Schaffer (2003) describes this view:

“The fundamentalist starts with (a) a hierarchical picture of nature as stratified into *levels*, adds (b) an assumption that there is a bottom level which is *fundamental*, and winds up, often enough, with (c) an ontological attitude according to which the entities of the fundamental level are *primarily real*, while any remaining contingent entities are at best derivative, if real at all.” (Schaffer 2003, p. 498)

Although the picture resulting from (a), (b) and (c) is rather familiar, and is implicit in some of the most influential works in contemporary metaphysics, it is surprising how little discussion we find in the literature concerning its justification. This paper attempts to reduce this lacuna by discussing whether there is any motivation for believing in (b), the fundamental level. To this effect, I shall assume that the layered model in (a) is correct, and ask what could be a good reason to think that there is a bottom layer of reality.

That there exists a fundamental level of reality is an assumption behind a number of important doctrines in contemporary metaphysics. Physicalists, for example, hold that there is a class of fundamental physical entities the distribution of whose properties they take to determine all facts in the world (Schaffer 2003). Mereological Nihilists claim that there is a class of mereologically simple entities which is exhaustive with respect to the number of material objects there are (Sider 1996; Sider 2013). Supporters of Humean Supervenience believe in a base of fundamental local qualities on whose distribution everything else supervenes (Oppy 2000). The list could easily be extended. Clearly, advocates of all these doctrines would have a hard time maintaining their views if it turned out that there is no fundamental layer of reality.

So is there a fundamental level? The discussion will proceed as follows. In section two, I present the hierarchical conception of reality in more details and clarify the notions of ‘level’, ‘structure’, ‘hierarchy’, ‘fundamental’. In section three, I dismiss some arguments to the effect that, as a matter of metaphysical necessity, there must be a fundamental level of reality. In section four, I discuss whether there is any definitive evidence from physics concerning the existence of a fundamental physical base, concluding that there isn’t. In section five, I present and defend the significance of a notion of ‘near-enough-fundamentality’ and argue that it is plausible to think that there exist a near-enough fundamental level.

2. *Varieties of Hierarchy*

My aim in this section is to give substance to the metaphor of the “hierarchy of reality”. It will be useful to begin by introducing some bits of terminology. A *hierarchy* is a particular kind of structure where certain items are arranged into higher and lower levels. Some familiar examples of hierarchies are the social hierarchy, dividing people on the basis of their social position or role, or a family’s hierarchy, dividing people on the basis of their relations of lineage from a common ancestor. Items of different levels are related to each other by what I call a *structural relation*. Structural relations are, so to speak, the connecting lines between items of higher and lower levels. In a hierarchy, structural relations are typically *irreflexive*, *asymmetric* and *transitive*. Consider, for example, the relation ‘richer than’ in the social hierarchy: clearly, A is not richer than itself; also, if A is richer than B, B is not richer than A; if A is richer than B, and B richer than C, then A is richer than C.

A number of philosophers and scientists have entertained the idea that the entities and facts of the natural world are somehow divided into a hierarchy of higher and lower levels. As physicist David Bohm explains, this picture is suggested by the structure and the discoveries of physics:

“Up to the present, the various kinds of things existing in nature have, at least as far as investigations in the field of physics are concerned, been found to be organized into levels.” (Bohm 1957, p. 96)

Traces of this hierarchical conception of reality can be found in a variety of debates in contemporary philosophy. For example, discussions on the mind-body problem are often said to concern the relation between the *higher-level* mental phenomena and the *lower-level* physical phenomena. Talk of the molecular, atomic and sub-atomic levels of matter also appears to suggest a hierarchical picture.

Such talk of “levels” among philosophers and scientists need not always be taken literally. It may be that, in some cases, what is really behind this talk is not the view that there are distinct levels of *reality*, each containing a specific class of entities or phenomena, but rather that there are different levels of *description* of the world. Thus one might hold that the molecular, atomic and sub-atomic are different levels of description of the same thing or phenomenon. We should not, however, be induced to think that all talk about levels of reality is in fact talk of alternative descriptions of the world. Indeed, the picture that is often implicit in the exposition of a hierarchical conception of nature is one according to which the division in levels is a feature of the structure of reality itself, not merely of our representations.

To mention just some examples, Oppenheim and Putnam (1953), who imagine a hierarchy with social groups at the top, followed by multi-cellular living things, cells, molecules, atoms and elementary particles, claim that different levels contains different entities, related to each other by a mereological (part-whole) relation. Similarly, in the passage quoted above, Schaffer describes the fundamentalist as being committed to the view that the *entities* at the fundamental level are primarily real, whereas the *entities* at the other level only derivatively so.

Thus, when I speak of the hierarchical conception of reality, I intend to talk about the common and more substantive view according to which the division into levels concerns the worldly items that constitute reality. I should mention here that it is possible to distinguish between a conception of the hierarchy of reality as including *entities* (where ‘entity’ is meant to

cover both *objects* and *properties*) and a conception of the hierarchy as including *facts*. These conceptions need not be exclusive, though they are rarely combined together. Indeed, it is generally expected from a plausible hierarchy of reality to include either what results from a suitable ontology of objects and their properties, or what results from a suitable ontology of facts. I shall sometimes refer to the former structure as an *entity-based*, and the latter a *fact-based* hierarchy.

2.1 'Level'

Let me move on to some issues concerning specifically how entities or facts can be arranged in a hierarchy. First, on what basis do we draw the lines between different levels of reality, dividing entities or facts into lower and higher? An option that I will exclude from consideration is that arranging things into a hierarchy is the result of an arbitrary process, so that virtually any way of organizing entities or facts into sets will make for a hierarchy. This option not only trivializes the sense of 'level of reality' that we are trying to capture here, but it also trivializes the question "is there a fundamental level?" that we are interested in answering; for these reasons, there is little point in discussing it here. As Kim (2002) puts it:

"Our judgments as to higher and lower should be motivated and principled, and this means not only that the criteria that regulate such judgments must be clear and metaphysically coherent but also that the ordering of objects and properties they generate must serve some useful purposes. (Kim 2002, p. 9)

If there is any motivation to think that reality is divided into higher and lower levels, this is because science at its current state appears to suggest a hierarchical picture. This very same science also seems to provide us with at least a hint as to what counts as lower or higher. It seems natural, for example, to distinguish a level of (facts about) the macroscopic objects of common experience; a level of (facts about) atoms and molecules studied by chemistry; then a level of (facts about) the sub-atomic particles postulated by physics; and perhaps others. To make this hierarchical picture coherent we must specify the relations that hold between entities

or facts at the various levels. Before going into that issue, however, I want to first comment a bit more about the very idea of a hierarchy of reality.

When we try to imagine a plausible hierarchy, it is rather tempting to think of “a single hierarchy of connected levels, from higher to lower, in which every object and phenomenon of the natural world finds its “appropriate” place” (Kim 2002, p.17). However, we should be open to the possibility that this simple conception of the hierarchy fail to be correct in a number of ways. First of all, it is possible that, on reflection, the idea of a *single* hierarchy of reality prove inadequate (or at any rate uninteresting for our purposes); instead we might need to countenance a *plurality* of hierarchies, each with its own metaphysically coherent distribution of entities or facts into levels, without there being any way of reducing one hierarchy to any other. We might call this the ‘pluralistic’ view.

We might also need to relax the assumption that the levels of the hierarchy are *connected*, in the sense that, for any two appropriately individuated levels of reality, it may not be the case that one is higher than the other (cfr. Kim 2002 for a definition of ‘connected’). Suppose, for example, that panprotopsyhism is true, that is, suppose that the fundamental physical entities “have certain special properties that are precursor to consciousness, and that can collectively constitute consciousness into larger systems” (Chalmers 2013, p. 2). It may then turn out to be natural to imagine a “branching” hierarchy of reality with a single bottom level, which then ramifies into two families of levels, with entities exhibiting physical properties alone on one branch, and entities exhibiting phenomenal properties alone on the other. It may then turn out to be impossible to say, for any couple of levels, one drawn from the first branch, one from the second, whether the former is higher than the latter.

We should also be open to the possibility that there be more than one appropriate place for some entities or facts. In this case, we will say that the condition of *no-overlap* for levels of reality fails: the worldly items from which we construe the hierarchy might have more than one appropriate place. Oppenheim and Putnam (1958) provide us with a clear example of how this condition might fail. Having distinguished between the levels of social groups, living

organisms, cells, atoms, and elementary particles, they go on to argue that any composite object which can be fully decomposed into objects at one level will also count as included in that level (cfr. Oppenheim and Putnam 1958, p.9-10: “each level includes all higher levels”). This implies that the level of elementary particles somehow already contains all entities in all other levels¹⁵.

Finally, and perhaps most interestingly, we should be open to the possibility that what counts as the appropriate place for some entity or fact may be a vague matter. Perhaps it may be a vague matter whether an aggregate of cells constitutes a living organism. Thus we might expect the division into levels of reality not to be fully precise. (The case is interesting for the following reason. Suppose that one takes the metaphor of the hierarchy of reality literally, and thinks that the division into levels is an objective feature of reality itself. Then the existence of borderline cases in whether a thing counts as belonging to one level or another *may* be, though it needn't be, a reason to believe in vagueness in reality).

I believe that nothing that I will say concerning the existence of a fundamental level will depend on whether we conceive of the hierarchy as single or plural, connected or unconnected, precise or vague. If someone is keen on endorsing any of these views, they can interpret me as asking some suitably modified versions of the question “Should we believe in the fundamental level?”. Thus pluralists might find it interesting whether there is evidence for a fundamental level within any of their hierarchies. Those who think that the division into levels is a vague one might find it interesting to know whether there is evidence for a fundamental level on any precisification for ‘level’ (be it semantic or ontic; also cfr. Akiba 2004).

2.2 *Varieties of Structural Relations*

We can now turn to discuss the various ways in which, depending on what one takes to be the lesson from the structure and discoveries of science, the levels of reality may be thought to be generated and how they may be thought to relate to each other. As we will see, these issues are

¹⁵ Incidentally, this conception of a collapsing hierarchy is not new. Here's how Dante describes his vision of God: “I saw that in its depth far down is lying / Bound up with love together in one volume, / What through the universe in leaves is scattered; / Substance, and accident, and their operations, / All interfused together in such wise / That what I speak of is one simple light.”(*Paradiso* XXXIII,85-89))

not unrelated. In some cases, by specifying a structural relation that holds between the worldly items that constitute reality one thereby has the means for suitably dividing reality into levels; in some others, specifying a structural relation is not sufficient. Some examples are below. A common way to think of an entity-based hierarchy is as being based on mereological (part-whole) relations, whereby objects at one level can be fully decomposed into objects at another, but not *vice versa*.

It must be said, however, that it's hard to see how mereological relations alone could provide the whole story about how levels in a hierarchy are generated. My body can be fully decomposed into cells, which in turn can be decomposed into atoms; and surely cells and atoms seem good candidates to be dignified of their own level. But my body can also be fully decomposed into a myriad of body-slices, though the latter would hardly occupy any level of their own in a plausible hierarchy. A somewhat natural suggestion at this point is to employ some kind of nomological characterization of the levels, in virtue of which the objects that are granted the dignity of having their own level are the ones that constitute a "significant nomic kind; that is there is a cluster of significant predicative and explanatory laws and regularities for objects belonging to this kind" (Kim 2003, p. 13). This is the view suggested, for example, by Oppenheim and Putnam in the abovementioned paper (1953). The reason why cells are given their own level, whereas body-slices are not, is because the properties that the former exhibit would, presumably, be the subject of significant laws or regularities.

Another common way to characterize the hierarchy of reality, which may or may not integrate the characterization in terms of mereological and nomological structure, makes central use of some relation of reduction which is supposed to obtain between the properties of objects at one level and the properties of objects at another. Hence a physicalist might argue that mental properties reduce to certain properties exhibited by complex systems like human brains, which themselves may reduce properties of micro-physical particles like, say, electrons and protons. If reduction is not enough to generate a plausible hierarchy (perhaps because the properties of my body reduce to those of my body-slices, but the latter do not constitute a level), we might further

restrict our attention to *causally efficacious* properties of objects (cfr. Block 2003), or to properties of objects that constitute a relevant nomic kind.

Depending on whether we adopt one relation or many to characterize the hierarchical structure of reality, we will describe the hierarchy as *uniquely* or *multiply* characterized. A final distinction that we might want to draw is between *homogeneous* and *heterogeneous* hierarchies. A hierarchy is homogeneous just in case all its levels are connected by the same structural relation or set of structural relations. A hierarchy is heterogeneous when it is not homogeneous. Heterogeneous hierarchies are by definition multiply characterized; but not all multiply characterized hierarchies are heterogeneous – some are homogeneous. To give an example of an heterogeneous hierarchy, it is sometimes argued that, unlike ordinary object, which exhibit a mereological structure, some entities posited by our best physical theory, such as quantum fields, do not exhibit such a structure. On this view, instead, fields and other higher level entities are connected to each other by virtue of some other relation, say a supervenience relation (cfr. also Ladyman and Ross 2012). We have therefore a case of an heterogeneous hierarchy, where there is no single relation that underlies the structure of the whole of reality.

2.3 'Higher' and 'Lower'

The previous remarks allow us to provide a definition of the notion “being on a higher/lower level”. Here’s a natural way to do this. Let L be an appropriately individuated level of reality, such that, for any pair of entities or facts belonging to that level, the relation ‘being on the same level as’ holds between them. Let’s then introduce a primitive notion of *ontological priority*, and its converse *ontological dependence*, which satisfies irreflexivity, asymmetry and (at least typically) transitivity. Finally, let’s define the *directionality* of a structural relation R as follows: R is “upwards” directed just in case, for any x, y, if xRy then x is ontologically prior to y (i.e. y is ontologically dependent upon x); conversely, R is “downward” directed just in case, for any x and y, if xRy then y is ontologically prior to x (i.e. x is ontologically dependent upon y). For instance, the structural supervenience relation is downward-directed: if A supervenes on B, but

not *vice versa*, then B is ontologically prior to A. On the other hand, the grounding relation is usually taken to be “upwards” directed: if x grounds y, then x is ontologically prior to y.

With these pieces of terminology, we can then define the relation “x (or the x’s) are on a higher level than y (the y’s)”, defined on an initial set of entities or facts, as follows. Let R be a relevant structural relation and let its directionality be upwards. Then:

x (or the x’s) is on a higher level than y (or the y’s) iff there are z (z’s) and w (w’s) such that x (the x’s) are on the same level as z (the z’s) and y (the y’s) are on the same level as w (the w’s) and wRz (or w’s R z’s).

A similar definition, with w and z suitably substituted, applies to the case where the directionality of R is downwards. To see how this definition applies to concrete examples, let’s start with the simple case of a hierarchy whose structural relation R is defined as: xRy ’s iff x can be fully decomposed in the y’s. Assuming that R is a downward-directed relation (this is not uncontroversial: cfr. Schaffer 2009), the definition that I have just given will deliver the result that I am on a higher level than the particles that compose me (proof: substitute ‘x’ with ‘me’ and ‘the y’s’ with ‘my particles’). Then the relation wRz ’s will be trivially satisfied when ‘w’ is substituted with ‘me’ and ‘the z’s’ with ‘my particles’). Also, the definition above will also deliver the result that I am on a higher level than the particles that compose Barack Obama. For the particles composing Obama are on the same level as the particles composing me, to which I bear the structural relation ‘being fully decomposable in’.

The definition also allows us to contemplate the possibility of “branching” hierarchies, where connectedness fails. For if X is a level on branch one, and Y is a level on branch two, it is easy to see that the entities or facts belonging to X are not on the same level of the entities or facts belonging to Y, and yet it is not the case either that X is on a higher level than Y or *vice versa*. Hence we can say that X and Y are *incomparable*. Failures of no-overlap are also allowed by the definition. Indeed, it is possible that something is both at the same level as another thing and at a higher level than the very same thing. This may look suspicious, but in fact this is what we should expect if we have an overlapping hierarchy (following Oppenheim

and Putnam, we might define the *proper level* of an entity or a fact as the highest level in which that entity or fact appears in the hierarchy; if X is on the same proper level as Y, then X cannot also be higher than Y, or vice versa, whereas if X is on the same level as Y then X can be on a higher level than Y).

As I pointed out before when distinguishing uniquely and multiply characterized hierarchies, sometimes we will need to complicate our characterization of the structural relation R by adding more content to it, e.g. xRy 's might be something like "x can be fully decomposed into the y's and the properties of x supervene on the properties of the y's". This is fine according to the definition so long as R maintains a unique directionality. Lastly, in cases of heterogeneous hierarchies we might need to improve the definition by considering more than one structural relation. The details of the improved definition won't be relevant in the following discussion. What matters is only that the definition presented above can be made flexible enough to return nice results in all the various types of hierarchical structure. I think I have given enough evidence that this is actually the case.

2.4 'Fundamental'

Having defined a hierarchy as a metaphysically coherent system in which entities or facts are grouped into higher and lower levels, I now turn to discuss what it means to say that a level is fundamental. There are at least two notions that are commonly associated with the idea that a level of reality is fundamental. These are the notions of *Primality* and *Completeness* (cfr. Bennett 2014). The idea behind the notion of *Primality* is, roughly, that the fundamental level is not dependent on any other level; in other words, the fundamental level is where all dependence chains terminate. The idea behind completeness is, instead, that the fundamental level accounts or is in some sense 'responsible' for all higher levels.

It will be helpful to give a more rigorous definition of *Primality* and *Completeness*. It seems relatively straightforward to define *Primality*. What we need to do is first to define a notion of 'primeness' applying to entities or facts. Suppose R is a structural relation and let its

directionality be fixed on upwards (nothing hangs on whether the directionality is fixed in this way). Then we can state the following condition:

Primeness. An entity or fact x is prime iff there is no y such that yRx .

To give an example, consider the case of a simple hierarchy whose sole connotation is that of a mereological structure. In this context, *Primeness* holds only if there are entities such that nothing bears the structural relation of *proper parthood* to them; in other words, only if there are objects in the hierarchy that have no proper parts, i.e. mereological simples.

With this notion of *Primeness*, we can then define *Primality* as follows:

Primality: A level of reality is *primal* iff it contains only prime entities or facts.

Finally, we can introduce the notion of a level of reality being *maximally* primal just in case it contains all and only prime entities or facts. (Not in all cases a primal level of reality is maximally primal. Consider, for example, a dualist-friendly hierarchy of reality: on this picture, there may be a level of prime physical properties or facts, and a level of prime phenomenal properties or facts. Although the primality condition is satisfied in both cases, no level of reality is plausibly *maximally* primal.)

It is important to clarify here that the notion of a level of reality being primal must not be confused with the more specific notion of a level of reality being the endpoint of a finite chain of dependence. Indeed, it is entirely possible that the chain of dependence be infinite, and still *Primality* be satisfied. To see why this might be the case, we need to draw a distinction between *finiteness* and *well-foundedness*. A chain of dependence is finite when there are a finite number of steps leading from the entities at the highest level to the base level. A chain of dependence is instead well-founded when there is a least element in the chain. Clearly, well-foundedness does not require finiteness: the chain might be infinite, and still have a least element. (If you are not convinced, consider how many steps you need to go from the number 0.5 to the number 0 in the real interval $[0, 1)$. Answer: infinite. Still the interval $[0,1)$ does have a least element.) Hence finite chains of dependence are well-founded; but not all well-founded chains need to be finite.

So far for *Primality*. What about *Completeness*? The basic thought behind *Completeness* is pretty clear. Here's how Sider (2011) puts it:

“It is natural to assume that the fundamental must be “complete”, that the fundamental must be in some sense *responsible for everything*” (my italics, Sider 2011, p. 105).

Schaffer (2010) adopts a metaphor to express a similar idea:

“The basic entities must be complete, in the sense of providing a *blueprint for reality*” (Schaffer 2010, p. 39)¹⁶

However, it proves difficult to specify what is meant by “being responsible for everything” or “providing a blueprint of reality”. One option, which Sider considers and then dismisses, is to think of a complete level of reality as one that *necessitates* the facts at all other levels. Along similar lines, Schaffer characterizes completeness primarily in terms of *duplication*: “a plurality of entities is complete if and only if duplicating these entities, while preserving the fundamental relations between them, metaphysically suffices for duplicating the cosmos and its content” (2010, p. 39). Still another option is to appeal to some notion of grounding or ontological priority: the facts at the fundamental level *ground* the facts at all other levels.

Here I am not going to discuss which option best captures the notion of completeness (but see section five for a positive proposal). What matters is just to signal that *Primality* and *Completeness* may come apart (cfr. also Bennett 2014). Indeed, not all collections of entities and facts that satisfy *Primality* need satisfy *Completeness*, and *vice versa*. Suppose, for example, that in a world similar to ours, quarks were fundamental. Now consider the set constituted by a single quark of that world. Clearly, this level would satisfy *Primality* but not *Completeness*. Indeed, at least in worlds similar to ours a single quark cannot be responsible for the whole of reality.

Similarly, it is possible to think of cases where *Completeness* is satisfied but *Primality* isn't. Consider, for example, cases of so-called circular dependence (cfr. Bliss 2014). Entities at level

¹⁶ It must be said that in neither case the completeness requirement is meant to be definitive of fundamentality – Sider thinks there is no definition of fundamentality, whereas Schaffer thinks that completeness is a necessary but not sufficient condition upon something being fundamental.

X depend on entities at level Y, which depend on entities at level Z. However, it turns out that the latter entities ontologically depend on those contained in X, whereby the circle. (The example is a case of a failure of the transitivity of ontological priority, to which possibility I remain open). It is not difficult to see that, in this universe, each level satisfies the *Completeness* condition. However, no one satisfies *Primality*. Hence there could be complete levels which are not primal.

Since *Primality* and *Completeness* are distinct notions, it is natural to ask: how exactly do they relate to the idea of a level of reality being fundamental? Though both these notions correspond to fairly strong intuitions that we have about fundamentality, it is arguable that *Primality* benefits from some kind of conceptual priority over *Completeness*. One motivation for this claim comes from Bennett (2014), who asks us to imagine a one-level hierarchy, where everything is fundamental. As she points out, the reason why the single level can be called fundamental is not that the entities this level contains are complete; indeed, the entities of that world are responsible for nothing. Rather, we are willing to call that level fundamental because all the entities it contains are prime.

Thus, it seems that considerations of *Primality* come before any others when it comes to decide on absolute fundamentality. For this reason, in what follows I will adopt *Primality* as the basic notion of fundamentality. Hence I am going to discuss whether there is any compelling a priori or a posteriori argument in favour of the existence of a primal level of reality. In most cases, by ensuring that a level of reality is primal (or, better, maximally primal) one thereby also ensures that it is complete. This won't be guaranteed in all cases – possible exceptions might include failures of transitivity of grounding. Yet this won't make much of a difference for the purposes of our discussion.

3. *A priori arguments for the fundamental level*

The thesis that there is a fundamental level of reality has the status of a metaphysical claim. As metaphysics is primarily informed by science, it would seem natural to look at science, and

in particular physics, when searching for evidence in favour of such a level. Often, however, metaphysicians have taken a different approach to the question whether there is a fundamental level of reality. In particular, they have thought that the question could be resolved by way of *a priori* reflection alone. In this section, I am going to argue that various attempts to demonstrate the existence of a primal level by way of *a priori* reasoning fail. This puts into serious question the idea that the question at issue can be answered through armchair methodology alone.

3.1 What is wrong with an infinite regress?

The main line of argument that philosophers with fundamentalist sympathies have taken in favour of the existence of a fundamental level of reality takes the form of the following “metaphysical worry”: if there was no bottom level of reality, we would end up with a scenario where things at one level are dependent upon things at another level, which are themselves dependent upon things at another level, and so on *ad infinitum*. In so far as there are independent reasons to reject the possibility of this scenario, it seems possible to conclude that, as a matter of necessity, there must be a bottom level.

But what is so wrong with the hypothesis that there might be an infinitely descending chain of levels? Surely the hypothesis is logically consistent. Furthermore, the hypothesis is *prima facie* conceivable. The hypothesis of an infinity of levels of reality with increasingly smaller particles, each of them having other particles as their parts, without an end, seems not hard to conceive. David Lewis called this kind of scenario a *gunky* world, where a *gunk* is an object such that each of its parts has something as a proper part. Similarly, it seems not hard to imagine a world in which the grounding relation fails to be well-founded (“turtles all the way down..”). So why think that these gunky scenarios are impossible?

Perhaps one reason might be that these scenarios can be ruled out *a priori* on grounds that they involve a situation of infinite regress; such situations may be considered, though logically consistent and conceivable, metaphysically unserious. But philosophers often distinguish between *benign* and *vicious* infinite regresses. A paradigmatic example of a benign regress is

the *truth regress*: the truth of the sentence ‘*p* is true’ can be partly explained by the fact that ‘*p* is true’ is true, and also that ‘‘*p* is true’ is true’ is true and so on *ad infinitum*. The existence of benign infinite regresses in addition to vicious ones leads to the following point. It is not sufficient for proving the existence of a fundamental level to argue that its non-existence leads to regress. If an “argument from regress” has any chance of being successful, we need to be able to say what is wrong with the regress, why it is unacceptable.

It would be ideal at this point to have a theory specifying the necessary and sufficient conditions for an infinite regress to be vicious. Unfortunately, however, we have no such theory; what counts as a vicious infinite regress remains in fact an intricate and controversial matter (cfr. Nolan 2001). Thus, in order to show that the infinite regress of the levels of reality is vicious, one can either try to bring out its similarity to alleged cases of vicious infinite regresses, or argue that the regress of levels of reality is unacceptable for *sui generis* reasons. I will explore both these options in what follows.

There is a certain similarity between the failures of well-foundedness of ontological dependence that we are dealing with and what is known as *Bradley’s regress*. The latter problem can be described thus. Suppose that the fact that *a* is *F* obtains. In order for *Fa* to obtain, there must be something that relates the individual *a* with the property *F*, what philosophers call an *instantiation* relation. Call this relation I_1 . Now consider the fact that the relation of instantiation relates *a* and *F*. By similar reasoning as above, in order for there to be the fact that *a* instantiates *F*, there must be something relating the individual *a*, the property *F* and the relation I_1 , say the relation I_2 (which may or may not be the same relation as I_1); but then, by the same reasoning, there must be relations $I_3, I_4 \dots$ and so on *ad infinitum*. Thus the chain of relations linking the individual *a* with the property *F* has no end. It follows that, for each atomic fact of the form ‘*Fa*’, either there is an infinity of instantiation relations, or there is an infinity of instances of the instantiation relation.

There is a common, though by no means universally accepted way to argue for the view that Bradley’s regress is vicious, and therefore needs to be rejected, which is as follows: the relation

I_1 is supposed to *ensure* that the fact that a is F obtains; the relation I_2 is supposed to *ensure* that the fact that a bears the relation I_1 to F , and so on. But it's hard to see how it could be possible for Fa to obtain in the first place if the chain of relations that are supposed to ensure that Fa obtains is without end. Thus, on the assumption that Fa obtains, the regress scenario is unacceptable. (A difficulty here is to spell out exactly what it is for a relation such as I_1 to *ensure* that the fact that a is F obtains. A natural proposal invokes some notion of partial ground, as in Fine (2010): that the relation I_1 ensures that the fact that a is F obtains means that the fact that a is F is *partially grounded*, or obtains *partly in virtue of*, the fact that the relation I_1 holds between a and F . There may be worries about this notion of partial ground (cfr. Fine: 2010); evaluation of these issues is, however, beyond the scope of this paper).

An analogous argument seems to be available in the case of the gunky-like scenarios that we are interested in. Here's, for example, an argument against the hypothesis of mereological gunks. Fact: I exist. Also, I have parts. However, it may seem difficult to imagine how it could be possible for my parts to compose me if each of these parts had further proper parts. It seems that composition must have started *somewhere*. Thus the following conditional seems intuitively correct: if there wasn't a mereologically fundamental level of simple particles, out of which I am composed, I would not exist. And it would follow from this that, on pain of denying that I exist, the hypothesis of an infinite descending chain of composition is incorrect.

Is this argument sound? We might find it intuitive, and this may be a reason to believe that it is correct. But it is important to notice, first of all, that this apparent intuitiveness is not universally accepted. Some philosophers, for example, deny that Bradley's regress is vicious; they think there is nothing wrong with the idea that an infinity of instantiation relations ensure that any single fact obtains. Similarly, some philosophers deny that there is anything intuitively wrong in the hypothesis of a gunky world.

The point here is not simply that these philosophers deny that the chains of dependence must bottom out somewhere, as perhaps may do someone who is willing to accept some counterintuitive consequence of the view that they have just proposed; rather they don't actually

share the intuition that fundamentalists appeal to when they argue against the possibility of infinite descent. Here's, for example, a passage from Sider (1993):

I find the *possibility* of gunk so compelling that I am willing to reject any theory that rules it out" (1993, p.9)¹⁷.

Thus, the appeal to intuitions can hardly have any dialectical force in persuading skeptics about the existence of a fundamental level.

Further, even if anti-fundamentalists were all to accept that there is something intuitive about the claim that, in order for something to exist, there must be a level of mereologically prime entities, that would still fall short of providing a compelling argument in favour of this claim. For fundamentalists would still need to provide a reasonable story about why we are allowed to put so much weight on such intuitions. Of course, there are a variety of cases in philosophy where our intuitive judgments may be plausibly taken to be highly reliable, e.g. when reflecting upon what course of action is just or unjust. Perhaps, although less uncontroversially, in some cases judgments about specific metaphysical issues may also be considered fairly reliable (e.g. when dealing with issues of personal identity).

However, I believe that, in the particular case under discussion, not only there appears to be few reasons to think that our intuitive judgments are reliable, but there also seem to be compelling reasons to think that our intuitive judgments are in fact *unreliable*. For one thing, assessing this issue requires us to engage in difficult imaginative exercises concerning finiteness and infinity, matters upon which our pre-theoretic judgments are notoriously dodgy. Secondly, it is arguable that the intuitions in the cases at issue may be influenced by an incorrect conception of the notion of composition. Perhaps the idea that, if there is anything at all, there must be a bottom level in the chain of composition might seem intuitive because we tend to think of the relations of composition as following a particular temporal order. Thus, we might be misled by the idea that, in order for there to be a composite object, there must be an "initial

¹⁷ Sider has eventually come to endorse the opposite view, by endorsing Mereological Nihilism – the view that there are no composite objects; see his 2013. On pain of denying that there is anything material, Nihilists have to reject the possibility of mereological gunk.

moment” where composition begins to occur. But this can hardly be the correct way to understand the notion. As Cameron (2008) puts it:

“It is not as if God has to have made a, b and c previously (literally) if he is to make the sum of a, b and c. Why can he not just make them all together?[...]”
(Cameron 2008, p. 9)

Thirdly, even assuming that the intuitions at issue are fairly reliable, and that therefore our intuition that there is a bottom level of reality is a reason to believe it to be true (in absence of any other reasons), it is still debatable whether this intuition is not trumped by other important theoretical considerations. One such consideration is based on the virtue of theoretical elegance. Suppose the hierarchy of reality is indeed as the fundamentalists believe it is. Suppose, for instance, that there are twelve levels of reality, with entities at one level decomposing into entities at further levels; atoms occupy the twelfth and most basic level. Why twelve levels? Presumably, the fact that there are exactly twelve levels is not necessary, for possible worlds are conceivable where this number raises to sixteen, or twenty-four.

Rather, that there are exactly twelve levels seems a contingent fact about where the entities of the natural world stop being divisible. But this fact may easily seem arbitrary: why not sixteen? Why not twenty-four? The hypothesis of the infinity of levels eliminates this intuition of ‘arbitrariness’ of the world: there are levels all the way down; no one is privileged to be the fundamental one. The anti-fundamentalist hypothesis is a more elegant view of the structure of the world.

A second kind of argument, due in its basic form to Zimmerman (1995), starts from the observation that the folk appears to be committed to gunks. The reason is that on the ordinary conception it is impossible that two things are in contact without also being the case that no other pair of objects are closer to one another than the two things in question. Zimmerman argues that the best way to reconcile this conception of the relation of contact with the existence of extended objects is to accept that extended objects are gunky, i.e. all their parts have further proper parts. If that is the case, it seems as though the ordinary conception of what it is for two

things to be in contact commits us to the infinite divisibility of matter. This might of course be a reason to reject the ordinary conception - provided that one has independent reason to think that there must be mereologically simple entities, which is what I am questioning here. Yet an argument seems to be available for the anti-fundamentalist here: reasons of theoretical conservatism would have us to prefer the hypothesis of the infinite divisibility of matter.

In all fairness, none of these arguments presents a particularly compelling (let alone devastating) case against the hypothesis of a bottom level of reality. The point of raising these arguments here is merely to show that, even once we have granted that there is an argument for the existence of the fundamental level starting from the intuition that such a level must exist, there are competing considerations in favour of the hypothesis of an infinity of levels yet to be weighed up.

3.2 Infinite chains of grounding?

So far I have been concentrating on the question whether there is any evidence in favour of a level of mereologically prime entities, or “atoms”. But, as I have argued in the previous sections, this question does not exhaust the problem of the existence of a primal level of reality. But does anything change when, instead of the relation of composition, we consider necessitation, supervenience or grounding? Some philosophers nowadays believe that, although there may not be evidence for the existence of mereologically simple particles, there are substantive *a priori* considerations in favour of the thesis that there must be a grounding base of the universe. Schaffer (2010), for example, endorses the view that mereological gunks are possible, and that therefore it is incorrect to think that there must be a fundamental level of mereologically simple particles (as far as science goes, Schaffer thinks, nothing ensures that we will not discover smaller and smaller particles). However, he also embraces the view that, as a matter of metaphysical necessity, there cannot be an infinitely descending chain of grounding. Hence, presumably, he must think that there is something special about the relation of grounding that makes failures of well-foundedness particularly unacceptable.

The problem is to specify what is unacceptable in the hypothesis. Schaffer (2010) writes that, if grounding failed to be well-founded, “being would always be deferred, never achieved”. It’s hard to say exactly what kind of idea Schaffer has in mind. Perhaps one line of thought is as follows. The notion of grounding is closely tied to that of *metaphysical explanation*. If entity E is grounded in entity F, then it would seem that the existence of F metaphysically explains the existence of E. But if the grounding chain does not bottom out in some ungrounded entity, nothing can serve as the ultimate metaphysical explanation of the world. In some sense, positing the existence of an infinitely descending chain of grounding would fail to explain why anything exists at all¹⁸.

To see the pull of this argument, it will be helpful to appeal to Aikin’s (2005) distinction between *mediate* and *global perspectives* on infinite regresses (Aikin employs this distinction in discussion of the arguments for epistemic foundationalism, but there is a strong analogy with the case of metaphysical foundationalism). A mediate perspective focuses on the relation of grounding that holds between one entity or fact and another; a global perspective focuses on the chain of grounding as a whole. Now suppose there is some non-well-founded grounding chain. From a mediate perspective, we can easily contemplate that entity E may be grounded in entity F, and then that F is grounded in entity G, and so on *ad infinitum*. The reason this is not problematic is that at each step we can think of asking ourselves: “what is the metaphysical explanation for X?” and at each step we do find an explanation: “X is metaphysically explained by Y”. Thus, at each step, we can think of our question to be fully answered by the existence of some entity Y.

However, the infinite regress becomes difficult to accept once we shift to the global perspective, for in this case we are interested in understanding how the whole itself of reality can sustain itself given the infinity of the grounding chain. Hankinson (1995) points to this difficulty with the example of the infinitely long train:

¹⁸ Incidentally, a similar argument is sometimes at the basis of the common complaint against dispositionalism; cfr. Armstrong (1997).

“Consider a train of infinite length, in which each carriage moves because the one in front of it moves. Even supposing that fact is an adequate explanation for *the movement of each carriage*, one is tempted to say, in the absence of a locomotive, that one still has no explanation for *the motion of the whole*”. (Hankinson 1995, p. 189)

Similarly, we might be induced to think that, if there is no bottom ground that metaphysically explains everything else (assuming that the relation of metaphysical explanation is transitive), then it is not clear how we could explain the whole of reality itself.

Does this argument succeed in proving that there must be a fundamental level? Clearly, people defending it assume that it makes sense to say of something that it provides the metaphysical explanation for something else. This is a disputable assumption. It is also disputable whether the question of what provides a metaphysical explanation for reality itself from a global perspective make any sense at all. Anti-fundamentalists may perhaps deny the intelligibility of this question from a global perspective. However, I believe that the argument suffers from a deeper problem, which is independent of the fact that it appeals to a questionable notion such as “metaphysical explanation” and that it assumes the intelligibility of the question of what provides a metaphysical explanation for the whole of reality.

The source of this problem lies in the shift between the mediate and the global perspective. When defending the argument, people tend to agree, for the sake of the argument, that it is coherent to think that entity E is grounded in entity F, and that F is grounded in G, and so on; what they point to is the necessity of a fundamental level if we seek to explain the whole of reality, i.e. in our toy example entities E, F, G, etc. and the grounding chain between them. However, when the shift to the global perspective is made, a new possibility presents itself: that the entities E, F, G and the grounding chain has its metaphysical explanation in some Ur-entity U, which has its explanation in some further Ur-entity V, and so on *ad infinitum*. In other words: an infinity of locomotives may be behind an infinite train.

Now, you might think that this response somehow begs the question against the objection of fundamentalists. After all, the question was how the anti-fundamentalist could explain reality itself if there is an infinity of grounds; it might seem unfair to say that an infinity of things explain the infinity of reality. But I think that foundationalists are making an assumption here that they are not entitled to make. They are assuming that the only possible way, from a global perspective, to answer the question why there is any such a thing as the whole of reality is by recognizing a single absolutely fundamental level (a single locomotive). But in this way they actually beg the question against the friends of infinite chains of grounding, for they might be willing to think that there is an infinity of things grounding the infinity of levels of reality. Hence the argument from the necessity of a metaphysical explanation appears to fail in some deep and instructive way¹⁹.

Another argument that Schaffer appears to suggest in his (2010) is that “[the assumption of the well-foundedness of grounding] provides the kind of hierarchical structure against which the question of what is fundamental makes sense” (p. 37). There are two readings of Schaffer’s claim here, and in both cases it appears straightforwardly false. On the stronger reading, Schaffer (or his bolder counterpart Schaffer*) is claiming that it is a precondition for reality to constitute a hierarchical structure that the chain of ontological dependence terminates. In a sense, without a base level there would not even be a chain of ontological dependence. This seems just false: as I have argued in section I, all we need for building up a hierarchy of reality is a set of structural relations. There seems to be nothing in the very concept of a hierarchy of reality that prevents it from displaying an infinitely descending chain of levels.

On the weaker reading, Schaffer (or its shy counterpart Schaffer**) is instead claiming that the question of what is fundamental only makes sense if the well-foundedness requirement is satisfied. This also seems false: for the question admits of perfectly sensible answers even if the well-foundedness requirement is not satisfied. In particular, if by ‘fundamental’ we mean ‘primal’, and the well-foundedness requirement is not satisfied, then the answer to the question

¹⁹ For an alternative way to respond to the argument from infinite regresses of grounding, cfr. Morganti (2014), who argues against what he calls the “transmission model of being” that is at work in the argument.

‘what is fundamental?’ is simply ‘nothing’. (More interestingly, if by ‘fundamental we mean ‘complete-fundamental’, in the sense explored in section VI, then the answer might be ‘something’ even if the well-foundedness requirement is not satisfied.)

Still another argument in favour of the hypothesis of a prime level of reality starts from the assumption that grounding is associated with some notion of *reality*. At least on some conceptions of metaphysical grounding, the fact that some entity is grounded in another implies that the former is in some sense less *real* than the latter (i.e. its reality is somehow derivative upon the reality of what grounds it). If this is correct, then, if nothing is ungrounded, nothing possesses the property of being real *tout court*. There are only higher and higher degrees of reality. But this situation may seem incompatible with the existence of reality itself. For if nothing possesses the property of being real *tout court*, then it is not clear how could anything be real at all - where reality actually comes from. On this type of view, the hypothesis that grounding is not well-founded would leave us unable to explain why it is the case that something is real; and this seems utterly unacceptable.

Does this argument fare any better than the previous ones? Hardly so. For one thing, the notion of “degrees of reality” seems to me as wrong-headed as that of “degrees of truth”. But let this pass. Even granting the intelligibility of this notion, it still seems extremely difficult to justify the claim that, in order for something to be real at all, there must be entities that satisfy the property of reality in a categorical way. Why should ‘real to a certain degree’ not count as a legitimate way for something to be real? It seems that there is no good reason. But if that is true, the existence of the familiar world that we experience and love is plausibly compatible with there being no such thing as an absolutely real entity. Reality to a certain degree may be good enough. (Platonists and Neo-Platonists of various sorts agree that the material world is somehow real only to a certain degree. Sure, in most cases they also recognize the existence of something being absolutely real, an *ens realissimus* such as God. But now take God out of this picture: what is wrong with the natural world being real only to a certain extent?). Thus the argument from the necessity of a level of categorically real entities fails.

Someone might object at this point that, if it is true that there is nothing wrong with such failures of well-foundedness of grounding, there is hardly any way for an infinite regress to be vicious. One reason this might be a problem is that arguments from infinite regresses (i.e. arguments that show the falsity or implausibility of claim P by showing that, if P obtains, an infinite regress follows) play a central role in our philosophical theorizing. Clearly, if no infinite regress is vicious, this common piece of philosophical reasoning (from the premise that P leads to infinite regress to the conclusion not-P) ought to be abandoned. Now I must say I am inclined to think that many of what philosophers took to be clear cases of unacceptable infinite regresses are actually non-vicious. It seems to me that the difficulty with recognizing these kinds of infinite regress as perfectly sound hypotheses stems from a common tendency to indulge in incorrect reasoning when dealing with matters of infinity. I won't try here to justify this claim about human reasoning, which goes well beyond the purposes of this paper.

That said, not all infinite regresses are benign. Consider the regress that Socrates was shown to be committed to in the platonic dialogue *Parmenides*. Socrates accepted the conjunction of the following three claims:

- a) If x, y, z exhibits property P, then there is something (a Platonic Form), P-ness, that x, y, z instantiate.
- b) If x exhibits property P, x cannot be identical with P-ness.
- c) For some P, P-ness is P.

The reason 1), 2) and 3) lead to regress is as follows. By 1), if x, y, z are abstract, then there is something, say Abstractness, that x, y, z instantiate. But Abstractness itself is plausibly abstract. It follows by 1) that there is a Form P-ness, that x, y, z and Abstractness instantiates. But, by 2), this Form P-ness cannot be identical to Abstractness. So it must be another form. But then there is also a Platonic Form that x, y, z, Abstractness and P-ness instantiate, which is distinct from P-ness. And so on *ad infinitum*.

I think it's plausible that the regress produced by the conjunction of 1), 2) and 3) is vicious, though it turns out to be difficult to say exactly why. I believe the answer in this case has

something to do with the fact that 1), 2) and 3) can also be shown to be jointly inconsistent (i.e. a contradiction follows from them). In particular, I agree with Nolan (2001) on the idea that:

“[I]nfinite regresses of this sort and the statement of a formal contradiction are different ways of bringing out an unacceptable feature.” (Nolan 2001, p. 532)

This leaves us with the question of what the unacceptable feature really is, especially in cases where a formal contradiction cannot be derived from premises leading to vicious infinite regresses. I don't have a theory of vicious infinite regresses, so unfortunately I cannot give an answer. My point here is just to make clear that I deny that all infinite regresses are benign, which was the concern that I started with.

To resume from the previous discussion, the arguments in favour of Schaffer's claim that grounding cannot fail to be well-founded have been found wanting. Together with the previous considerations, this puts seriously into question the common opinion that we have *a priori* reasons to think there exists a primal level of reality. In the next section, I am going to address the question whether we have sufficient *a posteriori* reasons.

4. A posteriori arguments for the fundamental level

There are two kinds of *a posteriori* arguments in favour of the existence of a fundamental level. Arguments of the first kind, which we might call *empirical*, purport to show that we have (or are in a position to have) epistemic access to fundamental entities or facts. Argument of the second kind, which we might call *inductive*, purport to show that we have significant methodological or inductive grounds to believe in the existence of a fundamental level. In this section, I will begin by considering the question whether there are compelling empirical arguments in favour of the fundamentalist assumption, then moving on discussing various types of inductive arguments.

4.1 Empirical arguments

Depending on what kind of experience people take to be evidence for the existence of the fundamental level, we might distinguish several types of empirical arguments. The ones that come first to one's mind are those purporting to show that fundamental entities or facts are an indispensable theoretical posit of contemporary physics – our best theory of the world so far. But contemporary physics is not the only source of alleged evidence for fundamentality. Not rarely, for example, philosophers with dualist sympathies in the philosophy of mind have claimed that phenomenal qualities are fundamental, and that we have epistemic access to these qualities – indeed, to their *essences* – by direct acquaintance (cfr. Chalmers 2006).

Here I will be restricting my attention to alleged sources of evidence for the fundamental level coming from contemporary physics. My reason is, first, that the issues concerning whether consciousness and intentionality are fundamental are so big, and the philosophical literature so vast, that there wouldn't be enough space to give them full justice here; second, that there seems to be a sense in which the problem of the existence of a fundamental physical entities appears to have some kind of priority over the problems of the fundamentality of consciousness and intentionality. Indeed, it would be surprising if the phenomenal or intentional facts turned out to be fundamental without the world containing at least some fundamental physical facts (cfr. also Schaffer 2003 for the claim that dualists need some physical entities to be fundamental).

But do we have evidence from physics concerning the existence of a primal level of reality? There is little doubt that the foundational picture of the structure of reality has been the dominant view among working scientists since the advent of modern science. Newton, for example, famously embraced the idea of a bottom layer of reality containing mereologically simple particles:

“Now the smallest particles of matter may cohere by the strongest attractions, and compose bigger particles of weaker virtue; and many of these may cohere and compose bigger particles whose virtue is still weaker, and so on for divers successions, until the progression end in the biggest particles on which the operations in chemistry, and the colours of natural bodies depend, and which by cohering compose bodies of a sensible magnitude.” (*Optiks*, 1704, p. 394)

This foundationalist picture of the structure of the universe remained alive in the post-Einsteinian era, even when further physical structure was discovered below the level of Newtonian atoms. Indeed, some of the most prominent physicists of the last century, including Einstein himself, endorsed the view that the physical universe displays a well-founded structure – the aim of physics being to discover just what the fundamental building blocks of nature are.

It is questionable, however, whether the idea that there is a primal level of reality should actually be considered a discovery of contemporary physics, rather than something of a background assumption of working scientists. According to the physicist David Bohm (1957), for example, the common opinion that there exists a primal level of reality is the heritage of a mechanistic picture of the universe which, though discredited by the discoveries of contemporary physics, continues to have an influence on the worldview of working scientist:

“For several centuries there has existed a very strong tendency for one form or another of the philosophy of mechanism to be generally adopted among physicists. [...] The mechanistic point of view involves the assumption that the possible variety in the basic properties and qualities existing in nature is limited, so that one is permitted at most to consider quantitative infinities, which come from making some finite number of kinds of things bigger and bigger or more and more numerous.” (Bohm 1957, p. 89)

Bohm (1957) argues that the discoveries of contemporary physics (especially after the development of quantum mechanics) put pressure on this mechanistic worldview, and in particular they make room for a different conception of the nature of the physical universe which is compatible with the hypothesis of “infinite qualitative descent”.

The physicist Hans Dehmelt (1989) has taken Bohm’s speculations one step further by proposing a physical model that actually predicts an infinite regression of subatomic structure. On this picture, the correct description of the structure of the universe at the subatomic level parallels the structure displayed by the triton, the nucleus of the isotope of tritium (${}^3\text{H}$):

“I propose to extend the triton substructure scheme to an infinite number of layers. Below the four layers listed above [d_1 nuclei, d_2 nucleons, d_3 quarks, d_4 subquarks],

they contain higher order d_N subquarks, with $N = 5 \rightarrow \infty$. In each layer the particles are not identical but resemble each other in the same way as quarks and leptons do, with masses varying as much as a factor 108. In an infinite regression to simpler particles of ever increasing mass, they asymptotically approach Dirac point particles. (Dehmelt 1989, 8618)

Dehmelt's hypothesis of an infinite regression of levels has not been confirmed by experimental results (as he acknowledges: "to test these speculations beyond $N=4$ one may have to go into a laboratory of cosmic dimensions" (*ibidem*, p.8618)). Interestingly, however, Dehmelt proposes more than one argument in favour of its plausibility:

"The triton model is distinguished by its great simplicity [since all substructures d_N , $N = 5 \rightarrow \infty$, replicate the same triton schema displayed by $d_1 \dots d_4$]. It also eliminates Dirac's unpalatable postulate that a physical entity, such as an electron or a quark, has *zero* extension in space." (*ibidem*)

These are all important virtues that make Dehmelt's hypothesis worth taking seriously. Of course, the hypothesis is still at a highly speculative level; yet there seems to be no *a priori* reason to dismiss the triton model as a radically bizarre picture of the physical universe.

The case against the fundamentalist picture of the universe is not complete yet, since so far I haven't talked about quantum field theory, which is often taken to provide a strong motivation in favour of fundamentalism. Quantum field theory concerns the behaviour and interactions of subatomic particles in a quantum world when Special Relativity is taken into account. Nowadays most physicists recognize quantum field theory as the best available framework concerning elementary particles physics; indeed, this theory is behind the so-called "Standard Model", which is regarded by the majority of physicists as the best available theory of the fundamental building blocks of the universe (incidentally, the Standard Model is incompatible with Dehmelt's hypothesis, and so the latter is to be rejected if the former turns out to be true).

The reason quantum field theory is taken to provide a motivation in favour of the existence of a fundamental level is that, according to a common interpretation, quantum field theory takes *fields* as ontologically primitives – or prime entities in my terminology. And, assuming that this

is the correct interpretation of the ontology of quantum field theory, it seems as though the best currently available framework for understanding what's going on at the level of subatomic particles suggests that there is a fundamental level of reality – a level that contains primitive quantum fields.

We needn't be convinced so easily, though. Indeed it is arguable that, without further scientific evidence, the possibility is still open for a non-fundamentalist picture of the subatomic structure of the universe. My reason for this claim comes from the recent discussions among physicists concerning effective quantum field theory (Georgi 1989, Cao and Schweber 1993, Huggett and Weingard 1995). A bit of background will be helpful. Quantum field theory characterizes fields as systems of particles where the state of each particle is determined by an infinite number of different parameters (in the usual terminology, physicists say that each particle has an infinite number of *degrees of freedom*). The presence of this infinite number of degrees of freedom for each particle presents a problem because, in order to calculate the physical state of a particular field, one would need to take into account an infinity of parameters.

To overcome this problem, and obtain meaningful physical outcomes from calculations, physicists “restrict” the number of degrees of freedom for the particles of some particular field, by only considering physical interactions that occur below some previously selected threshold of energy scale. This process (or something very much like it) is called *renormalization*. A renormalized quantum field theory is therefore a theory that restricts the degrees of freedom to some range of energy scale. It turns out that, given a particular energy scale, it is possible for a quantum field theory restricted to that particular energy scale to approximate another quantum field theory relative to a higher energy scale. The former theory is called an *effective* quantum field theory. The way an effective quantum field theory approximates another theory is roughly as follows: if the theory relative to the higher energy scale recognizes fields which include some particle e , the effective theory accurately predicts the state of the field at the higher energy scale by “pretending” or “doing *as if*” particle e didn't exist.

The trouble is that a quantum field theory can be effective with respect to another only if the difference in energy scale is not too large. If this difference is considerable, then it becomes impossible to obtain accurate results concerning the status of the field at the higher energy scale just by “pretending” that the particles in that system do not exist. Rather, in order to obtain precise results, we need to replace the original quantum field theory with another which better approximates interactions at higher energy scales. As a result, we would need to recognize particles whose interactions occur at some higher energy scale.

According to physicist Georgi (1989), the existence of these *non-renormalizable* quantum field theories might suggest a picture of the subatomic structure which postulates an infinity of particles. The reasoning can be put as follows: suppose T_1 is an effective quantum field theory approximating a higher-energy-scale theory T_2 . As it happens, there will be a theory T_m such that T_1 is not able to approximate it. So in order to approximate T_m we will need another theory, say T_n , that postulates the existence of a field at some higher energy scale. But then there might still be another theory T_p relative to some even higher energy scale that we would not be able to approximate. In that case we will need another theory – and therefore postulate more fields and more particles. According to Georgi, this process of piling up effective quantum theories relative to increasingly higher energy scales may continue *ad infinitum* (Georgi doesn’t commit to the view that it actually continues *ad infinitum*, but he does suggest that the infinity of effective quantum field theories is plausible given non-renormalizability).

Therefore, I think it is questionable whether there is any definitive evidence from current physics in favour of the existence of a fundamental level of reality (this of course doesn’t mean that there is any evidence for its non-existence). Hopefully, a future physics is going to settle this question once and for all. But in so far as we are ignorant of what future physics is going to tell us, it seems reasonable to be open to the possibility that there might not be a fundamental level.

4.2 Inductive arguments

Faced with the absence of conclusive evidence for fundamentality, some theorists may be tempted to argue for the hypothesis of a fundamental level on broadly inductive or methodological grounds (cfr. also Cameron 2010), the basic idea being that, even though there is no decisive evidence for the fundamental level, it is somehow epistemically better for us to believe that there is one. But what is epistemically better in holding the view that there is a bottom layer of the universe? One idea might be that the structure and discoveries of science suggest the existence of a fundamental level. Indeed, it seems that science has allowed us to discover deeper and deeper structure by using increasingly simple and economical principles. But, the argument goes, this would be an unlikely outcome if there was no fundamental level; thus, it is inductively plausible to suppose that there is such a level.

The premise that needs to be defended is the claim that, if there was no fundamental level, the structure of science would be less simple than it actually is. A motivation for this claim might appeal to the alleged causal efficacy of deep structure. Suppose there was no fundamental level, but rather an infinitely descending chain of more and more fundamental entities. Assuming that all these infinite entities have some however small causal power, it then would become very unlikely that we would be able to find simple and economical principles underlying the physical phenomena (in a way, there would be too many variables to account for). As science has not proved to be like this, it is plausible to suppose that there is no such infinitely descending chain of entities.

This argument can be resisted in at least two ways. A first kind of response would be to reject the assumption that all the entities in an infinitely descending chain of levels would be causally efficacious for the phenomena that we devise at the atomic, molecular or macroscopic level. Indeed, it seems possible that there be an infinitely descending hierarchy, but at some point these smaller and smaller particles become causally inert, or at any rate their causal efficacy becomes so insignificant that it counts for nothing in the determination of bigger

physical events. I am not prepared enough to defend the possibility of this scenario, but at least it seems to me perfectly conceivable.

Secondly, and perhaps more interestingly, it may be argued that scientists have actually neglected the causal efficacy of deep structure (perhaps by dismissing its manifestations as mere “noise”). Instead, the response goes, recognizing the causal efficacy of an infinity of entities below those currently known would make room for a better explanation of the physical phenomena that we observe. Consider, for example, the phenomenon of spontaneous symmetry breaking – the phenomenon, observed in the physics of condensed matter, in virtue of which a certain physical system spontaneously moves from a state of symmetry to one of asymmetry. Some scientists think that, at least sometimes, this phenomenon can be explained only by appealing to the fact that our world is indeterministic. But there may be another explanation, compatible with determinism, according to which the event of symmetry breaking demonstrates the causal efficacy of particles located at yet unrecognized levels of reality. Once again, a full exploration of this option is beyond the purposes of this paper. I just want to signal that there may be more than one response available to the defender of infinite hierarchies.

A second kind of argument in favour of the plausibility of the fundamentalist assumption appeals to the idea that there is something epistemically better in believing a simpler theory rather than a more complex one. According to this argument, a theory that postulates an infinity of levels of reality must be more complex than one that postulates only finitely many levels. Yet there seems to be no compelling reason, in our current epistemic state, to postulate an infinity of levels. Thus it seems more reasonable to stick to the simpler hypothesis that we live in a finitely complex world; indeed, other things being equal, simpler theories are more likely to be true.

One thing that needs to be clarified is the notion of simplicity that is involved in this argument. It has in fact become standard to draw a distinction between *ontological* and *ideological* simplicity (cfr. Sider 2011). The former notion concerns the so-called ontological commitments of a theory, i.e., the set of things that that theory claims to exist; the latter notion concerns, instead, the set of primitive (i.e. undefined) concepts employed to express that theory.

A further distinction is then usually made between *quantitative* and *qualitative* ontological simplicity, where the former refers to the kind of parsimony that a theory might exhibit with respect to the number of things that the theory claims to exist, whereas the latter has to do with the number of kinds of things that the theory claims to exist. Accordingly, it is possible to distinguish at least three arguments from simplicity against the hypothesis of an infinitely complex world, namely the arguments from *ontological quantitative*, *ontological qualitative* and *ideological* simplicity.

All these arguments could be resisted by someone who denies that the simplicity or parsimony of a certain theory makes for an epistemic difference: in other words, that we are more justified to believe in a simpler theory than in a more complex one. For instance, Parsons (1979) claims that:

“There is no *prima facie* reason to suppose that the universe contains a small number of things, or a small number of kinds of things. There is no *prima facie* reason to believe that a theory that endorses a smaller number of things, or kinds of things, or employs a smaller number of primitives, is simpler or likelier to be true or likely to yield more insight than another. Theories should not be compared by counting entities, kinds of entities, or primitives.” (Parsons 1979, p. 660)

Although this might be a way to resist the arguments against the hypothesis of an infinitely complex world, I won't be stressing this line of thought here. Instead, I will just assume the view that the simplicity of a theory is an epistemic difference-maker.

Even accepting the thesis that all forms of simplicity are epistemic virtues of a theory, it does not follow that all kinds of considerations of simplicity have the same weight in deciding which theory it is better to believe. For instance, it seems plausible that ontological quantitative simplicity is not as important as ontological qualitative or ideological simplicity. Other things being equal, a monist thesis in the philosophy of mind, according to which there is no distinction in kind between physical and mental entities, is preferable to Cartesian dualism even though the former thesis committed one to a significantly larger number of entities. Thus, a smaller number of entities is not worth a greater number of kinds. Also, the virtue of ontological

quantitative simplicity is sometimes not as important as theoretical elegance. For example, one reason to think that time is infinitely divisible seems to come precisely from the fact that a theory which postulates indivisible temporal “quanta” is inevitably going to look less elegant.

It is therefore no surprise that, of the three arguments that I listed above (the arguments from ontological quantitative, ontological qualitative and ideological simplicity), the weakest is the first. There are at least two kinds of responses that an infinitist might embrace against this argument. First, a “companion in guilt” strategy. It is arguable that, although it is true that infinitists commit themselves to the existence of an infinite number of things in the world, it is not clear those who believe in the fundamental level do not commit to the same view. Of course, fundamentalists *need not* believe in the existence of countably many things in the world. Yet don’t they believe in numbers? Sets? Abundant properties? In all these cases they wouldn’t be better off in terms of ontological commitments when compared to the infinitist.

Against the companion in guilt strategy, it could be replied that the real advantage of the fundamentalist hypothesis lies in the fact that it does not commit one to the existence of an infinite number of *physical* things. For it might seem independently plausible that we have no reason to suppose that there are countably many physical entities in the world. And it might seem that the infinitist hypothesis commits one to the view that there is an infinite number of physical entities. From these two premises, it would follow that it is better to believe in the fundamentalist hypothesis.

This reply is, however, easily dismissed. For even granting the questionable principle that we shouldn’t suppose that there are infinitely many physical things in the world, it is still not true that the infinitist is committed to denying this principle. Indeed, the view that there is no fundamental level is perfectly compatible with the claim that there is only a finite number of physical entities in the world. As an illustrative example, consider the case of an infinitist neutral monist, according to which both the physical and the mental properties are derivative upon some infinitely divisible, neutral (i.e. neither physical nor mental) stuff. Clearly, such a

person need not be committed to any more physical entities than a fundamentalist, and yet she would embrace the view that there is no fundamental level of reality.

As a second response against the argument from ontological quantitative parsimony, it may be recalled from section 3.2 that considerations of elegance and theoretical conservativity appear to favour the hypothesis of an infinitely descending hierarchy. If that is true, and if it is correct to think that such considerations are not always trumped by reasons of ontological quantitative parsimony, then the infinitist hypothesis might turn out to be overall better than the hypothesis that there exists a fundamental level, even though the latter might be ontologically less committal.

The arguments from qualitative ontological parsimony and from ideological simplicity are stronger, but can also be resisted. The key to an adequate response consists in pointing out that not all infinitely descending hierarchies contain infinitely many kinds of entities or can only be described with the help of an infinite number of primitives. Some theories of infinitely descending hierarchies can be as parsimonious with respect to qualitative ontological and ideological simplicity as theories that posit a fundamental level. To see why this can be the case, let me make this simplifying assumption: qualitative ontological infinite descent and ideological descent come together; in other words, any time a theory posits an infinite number of kinds of entities, that theory also feature an infinite ideology, and *vice versa*. (This correlation holds in many cases but not in all; the exceptions are no trouble for the argument I will make, though).

An often underestimated point about infinite descents is that it is possible to distinguish between at least two types of universes that lack a fundamental level (which I will here call ‘gunks’, for simplicity). This is the distinction between *rambling* and *boring* gunks (cfr. also Schaffer 2003 for a similar point). A rambling gunk, in my terminology, is an *ideologically and ontologically* infinitely complex world. A final and correct theory of the world in a rambling gunk would feature an infinite number of ontological commitments and only be expressible in a language with an infinity of undefined predicates.

Rumbling gunks are not the only possible kind of infinitely complex world. Another interesting type of world characterized by an infinite descent is a boring gunk, which is an infinitely complex world only with respect to *ontology*. It distinguishes from the rambling world by the fact that, after a certain number of structure or levels, the infinite descent becomes repetitive. This may happen, for example, in the case in which there is a level in the mereological hierarchy after which all further divisions are mere repetitions of a single schema or model, as in the hypothesis of infinitely divisible world put forward by Hans Dehmelt (1989). Clearly, it is entirely possible that a full-fledged theory developing Dehmelt's hypothesis of infinite descent only employed a finite number of primitive notions (just as one can generate the whole set-theoretic hierarchy just by making use of an undefined notion of set-membership).

Another interesting example of a boring gunk is the so-called worlds-within-worlds hypothesis discussed in Rabin (ms):

“Let the world Escher be a near-duplicate of the actual world [...]. Escher has microscopic fundamental particles, called fundamentons, facts about which ground the macroscopic facts about Escher. However, every fundamenton at Escher is itself a miniature replica of Escher. This miniature replica also contains fundamentons, which are themselves miniature miniature replicas. The second level of replicas is grounded in its fundamentons, which are themselves replicas of Escher. And so on *ad infinitum*.” (Rabin ms, p. 20)

Also in this case, a complete theory of the this-replica fundamentons of Escher need not have an infinite ideology, and yet it would be enough to work as a theory of everything.

With this distinction between rumbling and boring gunks at hand, we can now see where the trouble lies for the arguments from qualitative ontological and ideological simplicity. It may in fact be granted that we have methodological reasons not to suppose that our universe is a rumbling gunk. For one thing, reasons of ideological simplicity clearly disadvantage the hypothesis that we lived in such a world. Further, there seem to be considerable pragmatic reasons not to believe in the hypothesis of an ideological infinite descent. For a rumbling gunk is a world whose complete and correct description we - finite beings - would never be able to

achieve; thus, it is a world where the entire human enterprise of understanding the nature of reality loses its significance (analogously, Bernard Williams has once argued that a life without end is a life without value; cfr. Williams 1973).

However, both these considerations do not apply to the case of boring gunks. First, a boring gunk can be as ideologically parsimonious as a finitely complex world (and the same is true for qualitative ontological parsimony). Secondly, the scientific enterprise in a boring gunk would still be perfectly meaningful. As Schaffer (2003) has pointed out, discussing a case similar to Escher's worlds-within-worlds hypothesis:

“The discovery of such a supervenience base [in our scenario, Escher's fundamentons] would in every important sense constitute “the end of science”. No reason why science should have to end in particles. The base would give us all we could ever need for prediction and control (everything depends on it). There might be more science that could be done in terms of mapping out lower mereological structures, but there would be nothing unpredictable to be found.” (Schaffer 2003, p. 512)

I therefore conclude that the arguments from qualitative ontological and ideological simplicity, which are sometimes thought to provide a reason not to believe in the actuality of infinite descent, actually target only one kind of infinitely complex world – the rambling gunk. The arguments do not apply, however, to another kind of infinitely descending worlds, which I called boring gunks, and therefore they fall short of providing a reason not to believe in the infinitist's worldview.

5. Near-enough-fundamentality

To resume from the previous discussion, various arguments in favour of the existence of a fundamental level of reality have been found wanting. This result is not only intrinsically significant. Its importance is also increased by the fact that, as I noted in the introduction, a number of important metaphysical doctrines presuppose the existence of a fundamental level of reality. I mentioned, in particular, two relatively popular theses:

Microphysicalism: All facts obtain in virtue of the distribution of the fundamental microphysical entities and properties. (cfr. Loewer 2001)

Humean Supervenience: Everything supervenes on the distribution of fundamental local qualities in the spacetime. (cfr. Lewis 1986)

The fact that it is an open question whether there exists a fundamental level poses a problem for advocates of these and similar doctrines. For if it's true that one's belief in the existence of a fundamental level is ultimately not justified in our current epistemic state, then it seems that one's belief in metaphysical doctrines such as *Microphysicalism* or *Humean Supervenience*, which presuppose the existence of this level, is also unjustified. In this section, my aim is to suggest what I take to be an interesting line of response to the issue that I have just presented. I will begin by sketching an account of what may be called "near-enough-fundamentality", which makes central use of the notion of adequate metaphysical explanation. Then, I will show how this account can plausibly be used on behalf of philosophical theses like *Microphysicalism* and *Humean Supervenience*, even in the absence of evidence for the fundamental level.

The account that I am about to propose develops an insight from a footnote of David Lewis's "Ramseyan Humility":

"[A problem arises about] the properties instantiated in an infinitely complex world of "structures all the way down".[...] For it may be that all of the properties instantiated in such a world are structural. If so, and if fundamental properties are never structural, we must conclude that in such a world no perfectly fundamental properties are instantiated, but only near-enough fundamental properties." (Lewis 2009, p. 218)

Lewis's idea, as I understand it, is that even in an infinitely complex world of structures or levels all the way down, it is possible to individuate some entities which behave *as if* they were fundamental, without actually being perfectly fundamental. These are the near-enough fundamental entities. Clearly, once these entities have been individuated, nothing prevents us from reformulating theses like *Humean Supervenience* and *Microphysicalism* in terms of near-enough fundamental entities and properties, rather than in terms of perfectly fundamental ones,

thus avoiding the risk of tying the tenability of these doctrines to the problematic thesis that there exists a level of perfectly fundamental entities.

Lewis's proposal needs to be implemented in two ways. First, we need to provide an account of how to individuate near-enough fundamental properties. Secondly, we need to give a motivation for believing that, in an infinitely complex world, *there are* near-enough fundamental entities and properties. In an infinitely complex world, it is possible that there be no "natural joints" where to draw the line between the near-enough and the not-near-enough fundamental entities. Without further arguments, the existence of near-enough fundamental entities seems no less questionable than the existence of perfectly fundamental ones.

To give a clue of what I am about to argue, I believe that, in *boring* gunks, it is possible to individuate near-enough fundamental entities. They are exactly the entities whose remaining infinite divisions are mere repetitions. Of course, it is one thing to *say that* certain entities are near-enough fundamental, another to *explain why*, or in virtue of what, these entities can be described in this way. To achieve this result I will need a more refined account of near-enough fundamentality, which will be given momentarily.

5.1 Completeness is back

What could the near-enough-fundamental entities be? The basic intuition that I would like to capture is that they are precisely those entities which, in a finitely complex world, would play the role of absolutely fundamental entities. To understand what this role is, we need to go back to the remarks of section 2.5, where I distinguished between two notions associated with fundamentality, *Primality* and *Completeness*. There I argued that to say that a level is fundamental is, first of all, to say that the entities of such a level are not grounded on any other entities - this is the idea behind *Primality*; secondly, to say that a level is fundamental is to say that the entities of such a level are in some sense responsible for the existence of all entities at higher levels - this is what *Completeness* is about.

Although I argued that *Primality* has some kind of conceptual priority over *Completeness* in the definition of what's fundamental, it would be a mistake to overlook the importance of the latter notion. In fact, that of being responsible for all higher levels is a central role of the fundamental level. As Sider (2011) puts it:

“Completeness seems definitive of fundamentality. It would be a nonstarter to say that the fundamental consists solely of one electron: thus conceived the fundamental could not account for the vast complexity of the world we experience” (Sider 2011, p. 105)

This very same role – accounting for the vast complexity of the world we experience - is the one that I think is definitive of the near-enough fundamental entities. On my account, what makes it the case that a level is *near-enough* fundamental is that such a level satisfies at least one of the requirements of absolute fundamentality, viz. *Completeness*. (Incidentally, I take it to be a virtue of my account that it specifies in what sense the notion of near-enough fundamentality that I defend is still a notion of *fundamentality*). A level of reality in an infinitely complex world can thus deserve the title of ‘near-enough fundamental’ just in case this level, even though it does not contain prime entities, is nonetheless responsible (in a sense yet to be specified) for the entities at all higher levels.

The proposed approach to defining near-enough fundamentality in terms of the property of completeness faces an immediate problem. In brief, the problem is that the property of completeness seems by itself too weak a criterion for uniquely individuating near-enough fundamental entities in an infinitely complex world. Indeed, at least if we stick to the vague definition given above, according to which a level is complete when it “provides support” or is “responsible for” all higher levels, it is possible to imagine that several pluralities of entities, occupying different places in the hierarchy of reality, could satisfy *Completeness* simultaneously. For example, it may be that, in the actual world, the level of chemical entities is already complete: it is responsible for all the facts at the macroscopical level. But if it's true that the level of microphysical facts is also complete, we end up being committed to a hierarchy featuring two near-enough fundamental levels.

The reason this is a problem is *not* that there are two levels which, according to the definition, can be called near-enough fundamental. The same would be true under the assumption that a certain kind of Cartesian dualism is true: both physical and phenomenal facts are fundamental, and they constitute different levels of reality. Rather the problem with the previous case is that there seems to be some sort of *over-determination*: the level of macro-physical facts seems to be determined both from the set of chemical facts and from the set of microphysical facts. This result seems intuitively unappealing. In a way, it seems that we fail to individuate *the true responsible* for the existence of all higher levels of reality.

As a matter of fact, it doesn't help for the purpose of solving this problem to individuate the near-enough fundamental entities by the criterion that they are precisely the entities contained in the lowest complete level. In an infinitely complex world, there might be an infinity of complete levels; if the criterion of selection is simply to choose the lowest, the "responsibility" of containing the near-enough fundamental entities might be constantly unloaded from one level to another, without an end. Thus, if the problem of over-determination is resolved with the criterion that the lowest level wins, we end up with the problem of *over-exclusion*.

In what follows, I will show how it is possible to solve the problem of over-determination and the related problem of over-exclusion. I think the solution lies in reflecting carefully upon what it means to say that a certain level of reality is "responsible for" all higher levels. I will suggest that the best way to clarify the meaning of this expression is to appeal to the notion of an *adequate metaphysical explanation*. After specifying the conditions of adequacy for metaphysical explanations, I will conclude by showing how the proposed account overcomes the threats of over-determination and over-exclusion.

It is a familiar point in the recent literature on the notion of grounding that there exists a particular species of explanation, that Fine (2012) and others have called *metaphysical*, which is distinct from other species of explanations (e.g. causal or mathematical explanations) employed in science. The easiest way to discern metaphysical explanations from other species of explanation is by looking at the kind of relations they back. While the backing relation for

causal explanations is causation, the backing relation for metaphysical explanations is ontological dependence. To illustrate, if I were asked to give a *causal* explanation of my belief that the train will leave at noon tomorrow, I could mention the fact that someone told me so as a cause. Instead, if I were asked to provide a *metaphysical* explanation of my belief that the train will leave at noon tomorrow, I would need to list the complex series of neural states on which my belief arguably depends.

I believe that the notion of metaphysical explanation is most suited to clarify what it means for a certain level of reality to “be able to account for” or “be responsible for” all higher levels. On the account I am proposing, saying that a certain plurality of entities is complete with respect to the entities at higher levels is equivalent to saying that the existence of the former entities provides an *adequate metaphysical explanation* of these existence of all the latter entities. What this account relies on is the intuitively compelling idea that a central reason (if not *the* reason) for us to be interested in the fundamental level is precisely that a true and complete description of this level’s goings-on would exhaust our quest for a principle or a ground of the world we experience.

What I am now going to show is that by adopting this characterization of the property of completeness in terms of adequate metaphysical explanation one is able to solve the problems of over-determination and over-exclusion. To give a clue as to how I intend to resolve these problems, I will begin by pointing to a parallel with the problems of over-determination and over-exclusion that arise with respect to causal explanation. I will then briefly describe a standard solution to the over-determination and over-exclusion problem for causal explanations. Finally, I will suggest that the same solution can be plausibly extended to address the problems of over-determination and over-exclusion for metaphysical explanations.

Consider the following scenario. A bomb was programmed to explode at 1 p.m. At 1.05 p.m., though, the bomb is unexploded. Let’s suppose that an artificer was working at the bomb before 1 p.m.; and that the bomb was made in such a way that it would explode by cutting the

blue wire, and it would be neutralized by cutting the red wire. The following are three possible explanations of why the bomb is unexploded at 1.05 pm:

- 1) The artificer cut a coloured wire before 1 pm;
- 2) The artificer cut the red wire before 1 pm;
- 3) The artificer cut the red wire 12 minutes before 1 pm.

Let's first consider 1) and 2). Both these sentences, let's suppose, are true in the scenario just described. However, if one assumes that: a) the event of cutting a coloured wire before 1 pm is different from the event of cutting the red wire before 1 pm; and b) that propositions 1) and 2) are true in virtue of the obtaining of a particular causal relation between the artificer's intervention and the absence of the explosion; then we face the problem of over-determination: the failure of explosion seems to be explained both by the fact that the artificer cut a coloured wire and the fact that the artificer cut the red wire. This result seems intuitively unappealing.

At this point, many would be tempted to deny that 1) counts as an explanation of the failure of the bomb to explode. Indeed, I think this is exactly what one has to do. The problem, however, is to specify the criteria by virtue of which 1) doesn't count as an adequate explanation. A first natural candidate for specifying this criterion seems to fail dramatically. One might suggest that 1) doesn't count as an adequate explanation of why the bomb failed to explode because it is not *specific* enough; in particular, it doesn't make any mention of the crucial fact that the artificer cut the red wire, not the blue one.

This suggestion, however, doesn't help. To see why, let's consider the difference between propositions 2) and 3) above. According to the principle that the more specific the explanation is, the better, 3) is a more adequate explanation of the failure to explode of the bomb than 2). Setting aside the fact that this result seems intuitively very implausible, it is important to note that the above mentioned principle leads to absurd when combined with the hypothesis that time is infinitely divisible. If time is infinitely divisible, there will be an potentially infinite series of explanations more specific than 3); e.g. the proposition expressed by:

- 4) The artificer cut the red wire 12 minutes, 3 seconds, 1 thousandth before 1 pm.

These explanations can be put in an infinite series where each of them is more specific than the preceding one, with the result that no explanation will win. The problem here is that of over-exclusion: if the more specific explanation is better by default, then the explanation of the failure of the bomb to explode will be constantly deferred, so that the cause of this event will never be fully individuated.

In the literature on causal explanation, where the problems of over-determination and over-exclusion are well-known, the solution that has now become standard consists in recognizing that the adequacy of a causal explanation obeys a criterion of *relevance*. In the most general form of this account, it is claimed that the causal explanation of a certain event *e* is the most specific causal story of *e* that makes a difference. This criterion of relevance informs Mackie's (1974) definition of the cause of an event *e* as an "insufficient but non-redundant part of an unnecessary but sufficient condition for the occurrence of *e*"; it is also defended, in various forms, by Yablo (2003), Woodward (2003) and Strevens (2004).

In particular, Strevens (2004) has proposed an interesting theory of why certain causal explanations should be preferred to others. Without entering the details of the theory, we might say that, on this account, the selection of an adequate causal explanation can be described as the result of the contrast between two opposite forces: one (downwards-directed) that privileges the more specific explanation, and the other (upwards-directed) that privileges the explanation with more capacity of unification (i.e. the capacity of subsuming different phenomena under the same explanatory model or schema).

Strevens's account can explain why, in the example of the artificer and the bomb, 2) is selected as the adequate explanation. To continue with the metaphor above, the downward-directed force, which gives priority to the most specific explanation, tends to privilege the second explanation to the first, and the third to the second. At the same time, however, the first and second explanation turn out to have better capacity of unification of the third, since a greater number of facts, both actual and possible, could be explained by appealing to a similar explanatory model (for example, something similar to 1) and 2) could be used to explain the

failure to explode of a second bomb with a turquoise wire). In this system of weights, the intermediate explanation turns out to be the best explanation.

Just as for causal explanations, I think it is plausible that the conditions of adequacy for metaphysical explanations also include responding to a criterion of relevance of their own. Consider, for example, the following case. Let's introduce the predicate "bleen" to refer to the disjunctive property of being either blue or green. The following are possible metaphysical explanations of why a certain object X is bleen:

- 1) X is coloured;
- 2) X is blue;
- 3) X is cobalt blue.

Once again, I think it is plausible that 2) is the best explanation. Yet it is also clear that 2) is, in some important sense, less specific than 3). For one thing, we know that *being blue* is a determinable property of which being cobalt blue is a determinate. Given the plausible principle that determinable properties are less fundamental (depend on) its determinates, it seems reasonable to conclude that 2) counts as a more adequate metaphysical explanation than 3) even though it reveals less structure. Conversely, 1) is inadequate precisely because it doesn't get "specific" enough in the determinable/determinate hierarchy to bring out the relevant *locus* of the explanation.

As a brief summary of what I have been arguing so far, I began by noting two problems that arise when one tries to make use of the property of completeness as what is definitive of near-enough fundamentality. I then showed that the very same problems – over-determination and over-exclusion – arise in the case of the causal explanation. Finally, I explained the way philosophers of science usually provide a solution to these problems, and I suggested that the criterion of relevance to which they appeal for causal explanations is an independently plausible criterion for the adequacy of metaphysical explanations as well.

If what I said so far is correct, it follows that, through the notion of completeness alone, it is possible to provide a non-arbitrary criterion to individuate near-enough fundamental entities. On

my account, a level of reality is complete in the proper sense just in case it provides an adequate metaphysical explanation of all the entities at higher levels; where by “adequate metaphysical explanation” I mean an explanation that obeys a criterion of relevance. The near-enough fundamental entities will therefore be defined as precisely those entities, if there are any, that are contained in a complete level of reality.

To understand how this proposal applies to the case of an infinitely complex world, let’s consider the scenarios of a rambling and of a boring gunk, in this order. In the case of a rambling gunk, my proposal predicts, I think correctly, that it is not possible to individuate near-enough fundamental entities. The reason, to simplify, is that, when we are seeking for a metaphysical explanation of the world we experience, the downward-directed force, to discover more structure, is never exhausted. At each level, the better explanation always seems the one given by the lower level, with the result that no explanation will ever be found.

More interestingly, my proposal predicts that, in the scenario of a boring gunk, it is possible to individuate near-enough fundamental entities. This is because, once the infinite regression of levels becomes boring, the downwards-directed force, aiming to discover more structure, drains away, with the result that the search for the explanation ends at the last of the interesting levels. For example, in an Escher-like scenario (as described in section 4.3), the this-replica fundamentons will turn out to constitute the set of near-enough fundamental entities. This result seems to me intuitively plausible. After all, as Schaffer (2003) has pointed out, the discovery of level of fundamentons in Escher would already constitute in an important sense “the end of science”. My account just adds to Schaffer’s remarks the idea that this “scientific joint” of the universe also constitutes a “metaphysical joint”, and specifies this idea through the notion of completeness.

5.2 *What has been done*

To clarify what has been achieved so far, let’s return to the dialectic as I set it up at the beginning of this section. Defenders of philosophical theses like *Microphysicalism* and *Humean*

Supervenience have the problem of justifying their belief in these doctrine in the absence of evidence for the fundamental level. Following a suggestion from Lewis, I have proposed a solution to this problem. I have argued that there is a non-arbitrary way to individuate some near-enough fundamental entities in at least one kind of infinitely complex world. This is achieved through the notion of completeness. If this is correct, it becomes a non-trivial, substantive question to ask, of these near-enough fundamental entities, whether they are such that *Microphysicalism* and *Humean Supervenience* are satisfied.

One might protest that the solution I have proposed is not enough to save theses like *Microphysicalism* and *Humean Supervenience* from the problem I raised at the beginning of this section. After all, on my account, it is still the case that one cannot individuate near-enough fundamental entities if our world is a rambling gunk. However, at this point the defender of *Microphysicalism* and *Humean Supervenience* has an easy rejoinder. Following the arguments presented in section 4.2, she can plausibly defend the view that there is no reason to suppose that our world is a rambling gunk. In particular, she might argue that we have no reason from the history and discoveries of science to believe that our world is a rambling gunk. Also, she might argue that we have methodological reasons (in particular, reasons of ideological simplicity) to think that our world is not a rambling gunk.

As I argued in section 4.2, when these inductive arguments are used to defend the hypothesis that there is an absolutely fundamental level of reality, they fail because they don't take into account the possibility of *boring* gunks. But when used to defend the hypothesis that there is at least a near-enough fundamental level, these arguments do not fail, because a scenario of a boring gunk is precisely one in which there exist near-enough fundamental entities. Thus, the defender of *Microphysicalism* and *Humean Supervenience* has a plausible way to withstand belief in these doctrines even in the absence of evidence for an absolutely fundamental level of reality.

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