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Rasmus Jaksland

The Prospects and Promises of Naturalized Metaphysics

NTNU
Norwegian University of Science and Technology
Thesis for the Degree of
Philosophiae Doctor
Faculty of Humanities
Department of Philosophy and Religious Studies



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Abstract

Naturalized metaphysics questions the epistemic legitimacy of the traditional methods of metaphysics and proposes that a metaphysics motivated by science will do better. The veracity of these two core commitments of naturalized metaphysics have been much debated over the last two decades. Instead of continuing this debate, this thesis investigates from a methodological perspective what follows if one takes these two claims for granted. This is done through four articles: The first considers the claim made by some of its proponents that naturalized metaphysics overcomes the concerns that the logical positivists had about metaphysics. This article argues, however, that this is not in fact so by detailing what these concerns consist in and explaining how naturalized metaphysics has no resources with which to answer them. The second article explores the scope for conflicts between metaphysics and science within naturalized metaphysics. The article argues that naturalized metaphysics – contrary to what might be expected – is hospitable to certain kinds of resistance to science from metaphysicians. The scope for doing metaphysics within naturalized metaphysics is then the topic of the third article. Naturalized metaphysics explicitly aims to be an exercise in metaphysics, but it also importantly wants to inherit the epistemic legitimacy of science. This article argues that the latter can only be achieved at the expense of the former. The final article asks whether even the naturalized metaphysics of fundamental science could have consequences for social ontology. More precisely, the article speculates that the metaphysical consequences of a theory – quantum mechanics being used as the example – could be relevant at all levels of description despite its physical effects being negligible. In addition to these concrete interventions, the thesis gives a comprehensive account of the foundational claims of naturalized metaphysics including how they relate to those of other naturalisms and other recent trends in metametaphysics such as neo-Carnapian metaphysics.

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1 INTRODUCTION

The program of naturalized metaphysics advocates that metaphysics should be informed, motivated, and/or constrained by science and not by the a priori reasoning, conceptual analysis, intuitions, and common sense that have traditionally played a foundational role in metaphysics. Metaphysics using these methods will be denoted ‘traditional metaphysics’ or ‘autonomous metaphysics.’ Naturalized metaphysics has been widely debated in the last fifteen years prompted by the nearly concurrent defenses of naturalized metaphysics due to Katherine Hawley (2006), Tim Maudlin (2007b), and James Ladyman and Don Ross (2007). The latter – *Every Thing Must Go: Metaphysics Naturalized* – offers the most detailed and also the most severe criticism of the above-mentioned traditional methods of metaphysics, and it therefore, not surprisingly, stirred up a strong reaction among traditional metaphysicians too numerous to cite here (though some of them feature later in this thesis). The debate has been raging ever since.

Fifteen years on one might wonder what if anything new can be said about naturalized metaphysics at this point in time. Numerous arguments and points of view exist concerning the validity of the criticism of the traditional methods of metaphysics and likewise of whether science can be the basis for metaphysical truths, as naturalized metaphysics claims. Comparably little effort, however, has been spent on exploring what metaphysics might look like if naturalized metaphysics is taken as given and how this picture of metaphysics relates to other metametaphysical debates. This thesis aims to fill this gap, though it can of course only do a fraction of this exploration.

As such, this thesis is neither a defense nor a critique of naturalized metaphysics. Rather, it seeks to synthesize the promises of naturalized metaphysics – what it aims to do and warns against – based on these fifteen years of literature (though giving particular emphasis to Ladyman and Ross (2007)) and assess, in a number of specific cases, what prospects this leaves for metaphysics *and* metaphysicians when so naturalized. In the spirit of exploring the prospects of naturalized metaphysics, the soundness of its central claims will not be questioned and will in general be assumed, though explicating the precise content of them – and their motivation – is an important continuing goal throughout the thesis. The overall purpose is instead to assess the implications of naturalized metaphysics when one follows through on these central claims.

This, in a sense, amounts to taking a normal science approach to naturalized metaphysics. Normal science leaves the foundational questions behind and instead explores the landscape laid out by the paradigm. As Thomas Kuhn

argues, normal science allows for “focusing attention upon a small range of relatively esoteric problems [...] in a detail and depth that would otherwise be unimaginable” (1970, 24). Normal science, Kuhn points out, is nevertheless of utmost importance to our understanding, not only of the implications of the paradigm, but also for our assessment of the paradigm itself. The anomalies of a paradigm are after all typically revealed by such deep and detailed normal science. By analogy, this project aims to assess the prospects of naturalized metaphysics by exploring its (sometimes esoteric) details instead of discussing its foundational claims.

The focus will as such still be on methodology. The thesis therefore emphasizes work that discusses naturalized metaphysics from a methodological point of view and less will be said about works where this methodology is used. The latter includes Ladyman and Ross’ defense of and commitment to ontic structural realism (2007, chap. 3) and rainforest realism (2007, chap. 4). While Ladyman and Ross arguably regard both as central to naturalized metaphysics as they conceive of it, an attempt will be made here to distinguish between the generally shared methodological commitments of naturalized metaphysics and those views that various authors find to follow from these commitments in conjunction with the results of science. While this boundary can hardly be sharply drawn, Ladyman and Ross’ ontic structural realism and rainforest realism will be assumed to belong to the latter category and therefore not discussed any further here.

The thesis is article-based and organized around four articles. These articles form chapters 4 through 7. Each of these chapters also includes a brief introduction that explains how the otherwise self-standing articles fits into the overall project of this thesis. The article in chapter 4 was originally published in 2020 in *European Journal for Philosophy of Science* 10(16), pp. 1-19, under the title “Old Problems for Neo-Positivist Naturalized Metaphysics.” The article in chapter 5 was originally published in 2021 in *European Journal for Philosophy of Science* 11(74), pp. 1-24, under the title “An apology for conflicts between metaphysics and science in naturalized metaphysics.” The article in chapter 6 is currently under review. Finally, chapter 7 is, apart from a few changes, identical to an article forthcoming in *Hypatia* with the title “Naturalized, fundamental, and feminist metaphysics all at once: The case of Barad’s agential realism.”

Chapter 2 and 3 introduce the general research context for the four articles. More precisely, chapter 3 provides a synthesis of what naturalized metaphysics aims to do and warns against – the outline of its core commitments – but builds on the history of naturalization through the last long century that is traced in chapter 2. These together reveal how naturalized metaphysics is part of a longer naturalistic tradition and whose core tenets go back to Roy Wood Sellars (1880-

1973) in the early 20th century. As everyone who studies naturalized metaphysics will know, these core tenets relate to the insistence, on the part of naturalized metaphysics, that philosophy must be deferential to science. However, the purpose of chapter 3 is say more about what this precisely means. From the perspective of the subsequent chapters, this importantly includes two clarifications: Contrary to what is sometimes claimed, naturalized metaphysics is not eliminative of metaphysics but rather *endorses* the metaphysical realism that is traditionally adopted by metaphysicians. The ambition of naturalized metaphysics is to generate justified claims about ultimate reality (where this is meant to carry all its usual metaphysical significance). Naturalized metaphysics, however, promises to do so without resorting to the traditional methods of metaphysics. Much of the subsequent discussion about the prospects of naturalized metaphysics concerns how to navigate between this methodological modesty and the ambitious aim of naturalized metaphysics. To stay true to both, it is argued, naturalized metaphysics must be rather restrictive but not as restrictive as some might believe. On this basis, the four articles of chapter 4 through 7 investigate the prospects and promises of a metaphysical methodology that takes the core commitments of naturalized metaphysics for granted.

Chapter 4 argues that despite the restrictions on metaphysics in naturalized metaphysics, these are insufficient to meet the worries that the logical positivists and Quine (as reviewed in chapter 2) had about metaphysics. The chapter therefore questions Alyssa Ney's claim that naturalized metaphysics shows "how a version of metaphysics may survive the genuine worries the positivists had about metaphysics" (2012, 76). This is not to say that these worries cannot be overcome. The purpose of the chapter is, importantly, not to make an assessment of the severity of these worries for metaphysics but rather to assess whether naturalized metaphysics is in any better position with respect to them than other metaphysics. The conclusion, as indicated, is that even granting naturalized metaphysics *all* the resources it purports to have, it cannot answer these worries. In the broader picture, this illustrates that naturalized metaphysics does not have answers to all the dominant metametaphysical issues. As both this chapter and chapter 3 emphasize, naturalized metaphysics is concerned with the epistemic probative force of the different approaches to metaphysics and argues, in this regard, that a metaphysics based on science is epistemically superior to other types of metaphysics. However, in being thus concerned with epistemology, it is hardly surprising that naturalized metaphysics cannot solve the semantic issues that the logical positivists raise about metaphysics. Doing so is not part of the promise of naturalized metaphysicians (at least other than in Ney's variant), but its prospects for informing these other metametaphysical debates is therefore similarly limited.

Continuing the exploration of the interplay between the promises and prospects of naturalized metaphysics, chapter 6 investigates the attitude in naturalized metaphysics towards conflicts between metaphysics and science. As might be expected, naturalized metaphysics is rather dismissive of metaphysicians who question the results of science, but other types of metaphysical resistance might fare better, as the chapter proposes. By the metaphysical realism of naturalized metaphysics, metaphysical questions are meaningful, though not always well-posed, but this can bolster some metaphysicians' insistence that science should have something to say in response to their questions. Without an answer to their metaphysical questions, even naturalized metaphysics can and should require more of science and, in this sense, offer science a bit of resistance. Again, this reasserts that, based on its core commitments, naturalized metaphysics is not – or least should not be – eliminative of metaphysics even when metaphysics puts up some resistance to science (if of the right sort).

While chapter 5 argues that naturalized metaphysics, as such, is less restrictive than some may have anticipated, other circumstances entail that naturalized metaphysics must be more restrictive than it ideally wanted to be. The underdetermination of metaphysics by science is one such circumstance and its impact on naturalized metaphysics is investigated in chapter 6. As before, naturalized metaphysics is taken for granted but so is this metaphysical underdetermination problem since the point, like in chapter 4, is to consider what resources naturalized metaphysics has for solving this problem. While proponents of naturalized metaphysics have reacted to metaphysical underdetermination in various ways, the requirement to avoid the traditional methods of metaphysics renders it difficult to break or overcome underdetermination. However, since naturalized metaphysics aims at justified claims about ultimate reality, it cannot simply let the multiple underdetermined alternatives be. Thus, underdetermination is very illustrative of how the promises of naturalized metaphysics can be challenged by what the relation turns out to be between metaphysics and actual world science. One strategy, however, consistent with the general commitments of naturalized metaphysics is to restrict the metaphysical alternatives to those taken seriously by science and hope that this suffices for some features to avoid underdetermination. Whether this strategy in fact succeeds is not the central issue in chapter 6. Rather, the interest is in the consequences for what is left to do for metaphysicians with this solution to underdetermination. The conclusion is: not very much. While naturalized metaphysics promises, at the outset, to be hospitable to doing metaphysics, the prospects for this activity in the face of the underdetermination of metaphysics by science are very different.

Chapter 7 takes the investigation of the prospects of naturalized metaphysics in a somewhat different direction. The debates of naturalized metaphysics often assume that the context is fundamental science and consequently fundamental metaphysics. Little is therefore written about the place and role of naturalized metaphysics beyond this context. A notable exception is Hawley's (2018) discussion of how social science might serve as the foundation for social ontology in analogy to the role of natural science in other naturalized metaphysics. Chapter 7 takes the rather different approach of considering the role of fundamental science for social ontology and social theorizing more generally. In this sense, it challenges the implicit assumption of Hawley's discussion that it must be social science, if anything, that shall serve as the basis for non-fundamental metaphysics, a sentiment that also Ladyman and Ross (2007, 5) seem to share. Indeed, the chapter investigates whether naturalized metaphysics – more particularly the metaphysics of quantum mechanics – might provide reasons for questioning the dichotomy between fundamental and non-fundamental metaphysics. Perhaps, therefore, even the naturalized metaphysics of fundamental science will have a place in social ontology and social theorizing broadly construed but in breaking down this boundary influences may also move in the other direction. Like chapter 4, this chapter, in this sense, explores the relation between naturalized metaphysics and other metametaphysical debates. It also follows the pattern of the previous chapters of taking the core commitments of naturalized metaphysics for granted, but it stands out compared to these in being much more speculative. As such, I am reluctant to commit to the conclusions of this chapter but would rather consider them results of explorations. They are ideas that follow from certain, arguably contentious, claims that nevertheless deserve investigation due to their refreshing and provocative character.

In sum, the chapters do not, as such, comprise one argument. Rather, they can be seen as variously exemplifying and inviting an engagement with naturalized metaphysics that leaves behind the repeated evaluations of its core commitments and instead do an effort to understand the kind of metaphysics that naturalized metaphysics provides for. This is especially so in the article-based chapters, 4, 5, 6, and 7, which show that naturalized metaphysics is in different ways both more and less restrictive than perhaps anticipated and that it has no new answers to some metametaphysical debates while intriguing possible implications for others. These are of course not exhaustive of the investigations into the metaphysics of naturalized metaphysics, and the conclusion will offer some suggestions for venues of further investigation within this theme. The chapters of this thesis, however, exemplify the diverse possibilities for these investigations into the promises and prospects of naturalized metaphysics.

2 A STORY OF NATURALIZATIONS

As the name indicates, *naturalized* metaphysics involves a naturalization. In itself, however, this is not very telling of the content of naturalized metaphysics since naturalizations, as this chapter details, take many forms. Indeed, Hilary Putnam polemically charges invocations of naturalism in modern philosophy as being next to vacuous:

philosophers – perhaps even the majority of all the philosophers writing about issues in metaphysics, epistemology, philosophy of mind, and philosophy of language – announce in one or another conspicuous place in their essays and books that they are 'naturalists' that the view or account being defended is a 'naturalist' one; this announcement, in its placing and emphasis, resembles the placing of the announcement in articles written in Stalin's Soviet Union that the view was in agreement with Comrade Stalin's; as in the case of the latter announcement, it is supposed to be clear that any view that is not 'naturalist' (not in agreement with Comrade Stalin's) is anathema, and could not possibly be correct. A further very common feature is that, as a rule, 'naturalism' is not *defined* (Putnam 2004b, 59, emphasis in original).¹

Putnam is certainly right that there has been a proliferation of naturalistic views all across the major subdisciplines of analytic philosophy. However, this chapter will try to indicate that there is a common intellectual history to naturalism in analytic philosophy whereby these – admittedly widespread – appeals to naturalism in analytic philosophy do share a common core, though its implementation differs somewhat across different naturalizations.

2.1 ROY WOOD SELLARS' THREE PILLARS OF NATURALISM

According to Barry Stroud, “[n]aturalism on any reading is opposed to supernaturalism” (Stroud 1996, 44) and details how this “naturalism says that there is nothing, or that nothing is so, except what holds in nature, in the natural world” (Stroud 1996, 44). On one reading, this (alleged) naturalist core amounts

¹ Likewise, David Macarthur and Mario De Caro write in the introduction to their anthology *Naturalism in Question* that “[a]n overwhelming majority of contemporary Anglo-American philosophers claim to be 'naturalists' or to be offering a 'naturalistic' theory of key concepts (say, knowledge) or domain (for example, ethical discourse). Naturalism has become a slogan in the name of which the vast majority of analytic philosophy is pursued, and its pre-eminent status can perhaps be appreciated in how little energy is spent in explicitly defining what is meant by scientific naturalism.” (De Caro and Macarthur 2004, 2).

to the metaphysical thesis of non-supernaturalism which is perhaps more clearly captured by Phillip Pettit when he proposes that “Naturalism imposes a constraint on what there can be, stipulating that there are no nonnatural or unnatural, praeternatural or supernatural, entities” (Pettit 1992, 245). Non-supernaturalism is the metaphysical thesis that there are no gods, spirits, intelligent designers etc. in so far as these are conceived as supernatural entities (see Jakslund (2021b) for further discussion of non-supernaturalism). This view is also variously known as ‘ontological naturalism’ (e.g. Papineau 2007; De Caro 2010) and ‘metaphysical naturalism’ (e.g. Draper 2005; Keil 2008; Ruse 2013). Non-supernaturalism as a metaphysical thesis is sometimes distinguished from the methodological view that explanations in terms of supernatural entities are illegitimate, which often goes by the name ‘methodological naturalism’ (e.g. Draper 2005; Ruse 2013; Halvorson 2016). While the latter can in principle be endorsed while rejecting the former, this difference will not be upheld here, and they will collectively be denoted non-supernaturalism.²

Non-supernaturalism is indeed endorsed by the early proponents of naturalism within the analytic tradition such as Roy Wood Sellars who introduces ‘naturalism’ by specifying that “its opposite is supernaturalism” (Sellars 1927, 217). Sellars understands this category rather broadly and thus qualifies how naturalism “stands in opposition to those movements which are called absolute idealism, transcendentalism, theism, in short, for supernaturalism in the large sense” (Sellars 1927, 217). Sellars remarks how this view of naturalism goes back to the German theologian and philosopher of religion Rudolf Otto.³ With the

² This slightly convoluted label is adopted since ‘ontological naturalism’, ‘metaphysical naturalism’, and ‘methodological naturalism’ are all also used as labels for several other and rather different naturalistic views as seen below.

³ Otto, of course, is not the originator of naturalism either. Otto himself explicitly recognizes the tendencies towards naturalism already in antiquity with Democritus and Leucippus and further sees aspects of naturalism

in the more modern systems of materialism and positivism, in the *Système de la nature* and in the theory of *l'homme machine*, in the materialistic reactions from the idealistic nature-speculations of Schelling and Hegel, in the discussions of materialism in the past century, in the naturalistic writings of Moleschott, Czolbe, Vogt, Büchner, and Haeckel, and in the still dominant naturalistic tendency and mood which acquired new form and deep-rooted individuality through Darwinism,—in all these we find naturalism, not indeed originating as something new, but simply blossoming afresh with increased strength (Otto 1907, 17–18).

A similar point is made when Michael Eldridge remarks that tendencies towards a (non-super)naturalism is found both in Hume in the 18th century and in Nietzsche in the 19th century (Eldridge 2004, 52). Likewise, Hillary Kornblith traces the “idea that philosophy must somehow be grounded in the sciences” to philosophers like “Descartes, Locke, Leibniz, Kant, Marx, Reichenbach, and numerous others” (1994, 49).

remark “[t]he following characterization of naturalism is true to its spirit” (Sellars 1921, 254), Sellars quotes from Otto’s D.phil. dissertation from 1905 (Otto 1907):

At first tentative, but becoming ever more distinctly conscious of its real motive, naturalism has always arisen in opposition to what we may call 'supernatural' propositions, whether these be the naive mythological explanations of world-phenomena found in primitive religions, or the supernatural popular metaphysics which usually accompanies the higher forms (Otto 1907, 18; quoted in Sellars 1921, 254).

While Otto emphasizes the non-supernaturalism also endorsed by Sellars, his explication is interesting for the observation that “naturalism has always arisen in opposition,” a notion that Sellars inherits. Though Otto appends “to supernaturalism,” opposition is perhaps a more central characteristic of all forms of naturalism. In a survey of naturalism, Jon Jacobs independently makes the similar observation that “[w]hether in epistemology, ethics, philosophy of mind, philosophy of language, or other areas, naturalism seeks to show that philosophical problems as traditionally conceived are ill-formulated and can be solved or displaced by appropriately naturalistic methods” (Jacobs 2019). Naturalizations are calls for reform.

Sellars’ opposition is to the idealism, transcendentalism, and theism of his day, and non-supernaturalism is the result.⁴ However, more than this non-supernaturalism, Sellars’ *motivation* for this opposition strikes the recurring naturalist note in the following century. The problem, according to Sellars, is that these “isms” belittle nature where “by nature is meant the space-time-causal system which is studied by science and in which our lives are passed” (Sellars 1927, 217). Nature is where the events unfold that we see before our eyes and what is investigated in more detail through scientific experiments *including*, Sellars emphasizes, those of biology, psychology, and sociology (1921, 266). The central motivation for Sellars’ naturalism is, in other words, that this nature, so central to the lives we live, must have a place of prominence also in philosophy. And since our best knowledge of nature comes from science broadly construed, “naturalism is the view of the world which founds itself upon the results of science” (Sellars 1921, 268).⁵ At its core, naturalism is not an ontological thesis

⁴ Casting idealism and transcendentalism as supernaturalism, as Sellars does, is somewhat unusual, but since this plays no role in the following, it will not be discussed any further.

⁵ Sellars also emphasizes how naturalism endorses the “self-sufficiency of the physical world, of nature, for a certain unity of process and material” (Sellars 1927, 223). This aspect of Sellars’ naturalism is more particularly what leads him to non-supernaturalism through the entailed monism that is more explicit when Sellars writes, “naturalism takes nature in a definite way

like non-supernaturalism, but a broader attitude or “cosmology” as Sellars (1927, 217) describes it to distinguish naturalism from for instance materialism. Elsewhere he qualifies that “materialism is naturalism *plus* or, to put it more precisely, is a specific form of naturalism” (Sellars 1944b, 686). The content and commitments of naturalism – including its stance on materialism and reductionism – will be formed by the development of science and consequently, “the texture and breadth of naturalism will alter as the sciences alter,” as Sellars (1921, 268) remarks. We might add to this that the texture of naturalism will likewise alter with the changes in the opposition. Non-supernaturalism will be displaced as the concretization of naturalism when the opposition to the philosophical primacy of nature as revealed by science, broadly construed, is challenged from other sides.

This deference to science, however, does not eclipse philosophy. To the question in the title of his paper “Does Naturalism need Ontology?”, Sellars’ answer is “yes” writing, “I conclude that epistemology and ontology are not impedimenta but ways of giving precision to the world-view growing out of science” (Sellars 1944b, 694). Philosophy should provide the epistemological basis of science and develop the metaphysics – the world-view – implied by our best scientific theories. Sellars considers as an example how Einstein’s relativity theory must have implications for the conception of and account for space and time in philosophy; “no philosopher can take Newtonian space and time seriously” (Sellars 1944b, 694). However, just because relativity theory replaces the Newtonian physics that served as the basis for much science-informed thinking in the preceding centuries, the role of philosophers has not diminished since for instance the task remains to find “clarification of categories like substance or stuff, space, time, causality, etc. And, as a philosopher, I am ready to claim co-partnership with scientific specialists,” as Sellars (1944b, 693) remarks. More generally, the progress of science will not render philosophy obsolete, but rather continuously provide naturalistic philosophy with theories whose world-view they can make precise; according to Sellars, “philosophy has a job to do and [naturalism] should not shirk it” (1944b, 693).

A final element of this job – apart from those of relating to the world-views of scientific theories and the clarification of central concepts – is the study of human knowing in science, philosophy and elsewhere with the understanding that humans are part of nature. For Sellars, a naturalized philosophy founded on the results of science must not overlook that nature is also where “our lives are

as identical with reality, as self-sufficient and as the whole reality” (Sellars 1927, 217). While I think this commitment is also widespread among naturalists, it does raise questions for instance about abstract objects which not all naturalists will agree on.

passed,” as quoted above, and thus that any naturalistic program must remember that its practitioners are part of this nature, a theme that is central to his criticism of materialism (Sellars 1944a). “The final problem of philosophy is to connect the fact and content of knowledge with its conditions. How does knowing occur in the kind of a world that is actually known? Knowing is a fact and must be connected up with the world which the sciences study” (Sellars 1921, 250). Any concretization of naturalism must be sensitive to the fact that the knowledge it alleges to produce is brought about by beings in that same nature. This leads Sellars to his evolutionary naturalism that emphasizes the role of philosophy in accounting for humans’ capacity for science and philosophy. Naturalists must not, as materialists have in Sellars’ view done with their focus on the physical sciences, forget epistemology and philosophy of mind and the associated sciences of biology, psychology and sociology (Sellars 1921, 266).⁶ As Sellars writes above, naturalism must remember to consider the question “[h]ow does knowing occur.” In Sellars’ spirit, we might add to this that any naturalism must consider the questions: How *can* knowing occur? And what are we capable of knowing about? Naturalism must consider how knowledge is possible, but also be critical of how knowledge, including that of naturalism itself, can be produced in nature as revealed by science: “philosophy is forced to consider those capacities and processes which make it possible” (Sellars 1921, 250).

For Sellars, naturalism is opposition. Its imperative is a call for naturalization prompted by failures to recognize the prominence that nature as revealed by science should have in philosophy and a disregard for the fact that philosophers are part of this nature with its associated implications for their capabilities.⁷ Together, opposition, prominence of nature and knowing in nature form the three pillars of naturalism for Sellars. This characterization of naturalism is very broad, but for Sellars this was purposeful since

this common naturalism is of a very vague and general sort, capable of covering an immense diversity of opinion. It is an admission of a direction more than a clearly formulated belief.

⁶ More precisely, Slurink identifies three main questions relating to humans being part of nature that primarily occupies Sellars: “the problem of realism in epistemology”, “the problem of ‘levels of organization’ in ontology,” “the status of subjective experience in the philosophy of mind” (Slurink 1996, 426).

⁷ In his survey of naturalism in American pragmatism in general, Eldridge identifies the similar motifs in their naturalism: “opposition to supernaturalism, association with science, and humanity as fully a part of nature” (Eldridge 2004, 52), quoting Sellars in particular (though providing less detail for his views on this matter). From a historical point of view, Eldridge is certainly correct to emphasize that the opposition is to supernaturalism specifically, but as argued above, at least Sellars’ non-supernaturalism is rather a *consequence* of opposition following the other two motifs; non-supernaturalism is a concretization of Sellars’ naturalism resulting from his philosophical context.

It is less a philosophical system than a recognition of the impressive implications of the physical and biological sciences (Sellars 1922, vii; quoted in Kornblith 1994, 50).

Naturalism is a research program as Michael Rea (2002) has proposed (though we shall not endorse here his associated criticism of naturalism), and naturalism therefore has many faces as Sellars also pointed out in an earlier quoted remark. Sellars, of course, is neither the first nor the only naturalist of his time, but the three pillars of naturalism he identifies offer a particularly apt characterization of the kind of naturalism that is traced here, more so than non-supernaturalism, and which has naturalized metaphysics as one of its branches.

To my knowledge, none of the proponents of naturalized metaphysics acknowledges a direct influence from Roy Wood Sellars though, but his son, Wilfred Sellars, gets an honorable mention by Ladyman and Ross as “[o]ne of our most distinguished predecessors” (2007, 1). And as Pouwel Slurink writes “much of the philosophy of Wilfrid Sellars is rooted in the philosophy of his father” (1996, 425).⁸ However, Wilfrid Sellars seems to be more of an inspiration to Ladyman and Ross’ (2007, sec. 1.3) conception of metaphysics as unification (which we return to in section 6.6). Their naturalism is instead more directly indebted to Charles Sanders Peirce – through Putnam (1995) – and to Willard van Orman Quine (Ladyman and Ross 2007, 8, 27).

2.2 OTHER NATURALISTS IN THE EARLY TWENTIETH CENTURY

As Michael Eldridge (2004) shows the kind of naturalism endorsed by Sellars was variously shared among his contemporary American pragmatists including Peirce, Dewey, and Santayana. The reader is referred to Eldridge for further details on the mutual influence between these figures. Sellars is only emphasized here since he states this naturalism with particular clarity. Pragmatism, of course, was not the only movement of the first half of the twentieth century that was captivated by science. Logical positivism, with many of its proponents being trained as scientists, also called for the closer integration of (empirical) science into philosophy. Here in the words of Moritz Schlick, one of the founders of logical positivism:

It is primarily, or even exclusively, the principles of the exact sciences that are of major philosophical importance, for the simple reason that in these disciplines alone do we find foundations so firm and sharply defined, that a change in them produces a notable upheaval, which can then also acquire an

⁸ For more on Sellars’ naturalism, see O’Shea (2010).

influence on our world-view (Schlick [1915] 1978, 153; quoted in Friedman 1991).

Philosophy should be informed by the findings of “the exact sciences” and – echoing the theme also found in Sellars – changes should be reflected in changes to philosophy. Also for the logical positivists, nature as revealed by science must take center place in philosophy. Schlick’s remark falls in the paper “The Philosophical Significance of the Principle of Relativity” that details how Kantianism with its synthetic a priori view of space is rejected by relativity theory. For Schlick, and with him the rest of the logical positivists, this was the ultimate proof that there are no special philosophical a priori means with which to justify synthetic propositions, and logical positivism thus grew out of an *opposition* to such philosophy (Friedman 1991). Nevertheless, Michal Friedman remarks that “[t]he positivists are nearly unanimous in explicitly rejecting a naturalistic conception of philosophy” (1991, 515). Likewise, Alan Richardson (2003) describes naturalism as something that was mobilized *against* logical positivism. However, what we are witnessing here is once again the ambiguity of ‘naturalism’ which in this context refers to Quine’s view of philosophy as continuous with science (which we shall return to shortly). Following Sellars’ understanding of naturalism, logical positivism does largely qualify as naturalistic. Indeed, speaking of the unity of science program within logical positivism, Herbert Feigl – a logical positivist himself – writes approvingly of “the assumption of a spatiotemporal-causal network in which the knowing subjects are embedded as genuine parts” that “[t]his is a thesis common to most forms of philosophical naturalism” ([1963] 1981, 315). Here Feigl even explicitly mentions qualification, also found in Sellars, that a proper naturalism must be sensitive to the fact that humans are part of nature.

While logical positivism, in this regard, is in agreement with Sellars and the American pragmatists, the movements differ in their attitude towards philosophy in general and metaphysics in particular, which is part of why Ladyman and Ross trace the intellectual roots of their project to pragmatism rather than logical positivism. Logical positivism is renowned for its criticism of much philosophy as exemplified by Carnap’s (1932) call for an elimination of metaphysics (discussed in chapter 4) and his suggestion that “*the logic of science takes the place of the inextricable tangle of problems which is known as philosophy*” (Carnap [1934] 1937, 279, emphasis in original).⁹ Putnam (1995)

⁹ In a few more words, Carnap argues that the only genuine (scientific) questions remaining – that is, questions which are not pseudo-questions – are “questions the individual sciences” which obviously belong respectively to these individual sciences and “the questions of the logical analysis of science, of its sentences, terms, concepts, theories, etc” (Carnap [1934] 1937, 279). In Carnap’s terminology, the logic of science comprises that the latter complex of questions.

emphasizes this as an important difference between pragmatism and logical positivism. Both movements endorse a version of verificationism which might be regarded as their concrete instrument for their naturalist opposition. However, “for the pragmatists the idea was that it should *apply to* metaphysics, so that metaphysics might become a responsible and significant enterprise,” where the logical positivists used it to “*exclude* metaphysics” (Putnam 1995, 293, emphasis in original). More precisely, the logical positivists used the verificationist criterion of meaning to argue that metaphysics was simply meaningless. The vision that Putnam attributes to pragmatism and which we also find in Sellars, as discussed above, is instead that metaphysics can be a legitimate enterprise *if* it abides by certain principles. For the pragmatists, or at least for Peirce through the pragmatic maxim, the meaningfulness of some discourse is instead to be decided by whether it has conceivable practical consequences, a notion that is argued to be more liberal than that found in logical positivism (Almeder 1979).

The concern, however, is still with the *meaningfulness* of metaphysics and other speculative elements of philosophy; the pragmatic maxim subjects metaphysics to a semantic challenge. In contrast, Sellars’ objection to non-naturalized philosophy is epistemic. His concern is that these parts of philosophy cannot be justified, while their meaningfulness is not challenged. In Peirce’s later writings there is, Cheryl Misak (1995, chap. 3) argues, a move towards a less semantically loaded understanding of verification such that the problem with sentences without practical consequences is that they “are of no use in inquiry and can be said not to aim at truth” (Misak 1995, 113). Peirce’s verificationist criterium is on this interpretation not meant as a bulwark against nonsense, but as a recommendation for those who “want to avoid romping down fruitless paths” (Misak 1995, 127). Any such statement that is without practical consequences will remain unperturbed by any possible experience (even understood very broadly). On the correspondence theory of truth, we might still speculate whether such statements are true or not. However, a pragmatist view of truth would not even apply to such statements whereby the problem with the pursuit of such speculation is not only its futility, but also the fact that it, as Misak points out above, is not aimed at truth (as pragmatically understood). Thus, we find in Peirce a pragmatic challenge to metaphysics and other speculative philosophy – a charge that it is of no significance to the study of nature – that lies somewhere between the semantic challenge of the logical positivists and the epistemic challenge that Sellars motivates with his naturalism (this difference between semantic, pragmatic, and epistemic concerns about metaphysics will prove important in chapter 4).

Sellars, the pragmatists, and the logical positivists see different hazards in and possible roles for philosophy. But despite these differences, their motivation is

to a large extent the same: An opposition against (parts of) the existing philosophical practice that has failed to see the importance of science for philosophy. A deference to science through naturalization is therefore required in philosophy. More than non-supernaturalism, this “scientific naturalism”¹⁰ – as it shall be called following Kincaid (2013), Keil (2008), and Prince (2007), among others – became the predominant naturalist trend in the twentieth century. It is a naturalism that is not explicated by the canonical antonyms of the constitutive morpheme 'natural': supernatural, religious, mind, freedom, culture, and society, but has stronger association with the 'natural' of 'natural science' as observed by Geert Keil (2008, 263). Or in Sellars worlds: “The spirit of naturalism would seem to be one with the spirit of science itself” (Sellars 1921, 254).

2.3 QUINE’S SCIENTIFIC NATURALISM: ONTOLOGICAL AND METHODOLOGICAL

More than those discussed in the previous section, Quine is arguably the central figure of contemporary scientific naturalism. At least Mario De Caro and David Macarthur find that “[o]ften scientific naturalists give the impression of thinking that philosophy began with the Quine” and add disapprovingly that these naturalists are prone to the opinion “that to read earlier texts is to leave philosophy behind for the study of the history of ideas” (2004, 17). Hopefully, the above has gone some way to remedying this condition, but Quine’s relevance does not therefore diminish.

Quine famously announced that “my position is a naturalistic one; I see philosophy not as an a priori propaedeutic or groundwork for science, but as continuous with science” (1969b, 129). This naturalism is evidently a scientific naturalism, and it has often been interpreted in the context of Quine’s seminal paper “Epistemology naturalized” (1969a) from the same year. Here, Quine defends the view that there are no special problems of epistemology to be approached by distinct philosophical methods. Instead, “[e]pistemology, or something like it, simply falls into place as a chapter of psychology and hence of natural science” (Quine 1969a, 82). Psychology, perhaps supplemented by other sciences, should simply replace epistemology or epistemology should at least be pursued using the *methods* of psychology. In this context, Quine’s position that philosophy should be continuous with science entails that “[p]hilosophy should defer to science, in that the methods it employs should be or be analogous to those of the sciences” (Roland 2013, 51). Philosophy should be in a methodological continuity with science and this type of naturalism is thus often

¹⁰ Notice that ‘scientific naturalism’ has also been used in the title of a recent book (Lightman and Reidy 2014) about John Tyndall and his contemporaries to designate views that are completely unrelated to those considered here.

denoted ‘methodological naturalism’ (Rea 2002; De Caro 2010; Papineau 2021). We shall here denote it ‘methodological scientific naturalism’ to distinguish it from the naturalist thesis otherwise going by the same name – as discussed earlier – which requires that explanations cannot appeal to supernatural elements.

While Quine’s methodological scientific naturalism celebrates the methods of science and promotes their use in philosophy (whereby philosophy will in some sense be subsumed under science), his focus shifts to the product of these methods – the scientific theories – and their role in philosophy in another seminal paper: “On what there is” (1948). Quine’s concern here is ontology rather than epistemology and more precisely how to determine what our ontological commitments should be. His proposal is to base this on our best scientific theories such that we are ontologically committed to those entities that are indispensable for the theories to be true. Quine writes: “we now have a more explicit standard whereby to decide what ontology a given theory or form of discourse is committed to; a theory is committed to those and only those entities to which the bound variables of the theory must be capable of referring in order that the affirmations made in the theory be true” (1948, 33). Quine is clearly promoting here a kind of scientific naturalism in ontology, but the proposal is not to determine our ontological commitments using the methods of science directly. As Jeffrey Roland observes, it is rather the *findings* of science – our current best scientific theories – that philosophy should defer to: “Philosophy should defer to science, in that the theories it advances should be consonant with those of the sciences. In case of conflict between philosophical and scientific theories, the latter *prima facie* trumps the former” (Roland 2013, 51). Philosophy should be deferential to the scientific account of the world and Quine’s broader naturalist point in “On what there is” is that ontology in particular must adhere to this principle. It therefore seems apt when Patrick Dieveney (2012) proposes to denote Quine’s view in “On what there is” as ‘ontological naturalism’ since it is a naturalistic proposal for how to supply our ontology. One might object, however, that this is a misnomer since, in being concerned with *how* to do ontology, this is a methodological rather than ontological thesis; indeed, it seems to fall under what Gabriele Gava (2019, 210) calls “moderate methodological naturalism.” Ontological naturalism (of the scientific form) has therefore instead been associated with “the view that our best construal of what there is, is what science says there is” (Raley 2005, 284). However, Raley immediately goes on to discuss this as a way to “find out what there is” (2005, 285), i.e. as a *procedure* for finding our ontological commitments. For present purposes, at least, there seems to be little point in distinguishing the methodological thesis that we should use the findings of science to determinate our ontology and the ontological thesis that the findings

of science determine our ontology. Rather, the interesting contrast is that identified by Roland between a deference, respectively, to the methods and findings of science. The former, the view that philosophy should adopt the *methods* of science and which Gava (2019, 210) calls “extreme methodological naturalism,” was denoted ‘methodological scientific naturalism’ above. The view that philosophy should defer to the *findings* of science will in turn be denoted ‘ontological scientific naturalism’.¹¹ This ontological scientific naturalism is not exclusive to naturalistic ontology. Rather, the ‘ontological’ is supposed to emphasize that the deference is to what science has discovered about the world. Both methodological and ontological scientific naturalism of course ultimately pay their heed to the practice of science, either in itself (methodological) or through its results (ontological). However, since naturalisms, as argued, are calls for naturalizations (in philosophy), and since scientific naturalisms all presumably admire science for the epistemic standing associated with its practice, it seems appropriate to denote scientific naturalisms by the nature of the naturalization it calls for and not by what it admires in science.

Returning to Quine, it may seem puzzling that he, on Gava’s construal, endorses both the extreme and the moderate view. Should philosophy – or at least epistemology – be replaced by science or is it sufficient for philosophy to be informed by science? Susan Haack (1993) suggests that these may be reconciled if Quine is interpreted as using ‘science’ rather liberally. While the textual evidence is ambiguous, Haack proposes an interpretation whereby Quine “sees epistemology not as a separate, distinctively philosophical, a priori discipline, but as an integral and interlocking part of the whole web of our beliefs about the world” (Haack 1993, 336). This is much closer to the ontological scientific naturalism in emphasizing the “beliefs about the world” that science has generated. The important point for Quine on this interpretation is that epistemology must take seriously the place of the knowers in nature or, as Haack puts it, “encourage the characteristic concern of modest naturalism with the nature and limitations of human beings’ cognitive capacities” (1993, 347). Quine’s slogan that philosophy is continuous with science might then simply signify that philosophy and science are both undertakings in nature and therefore “that philosophy and science are under the same kinds of pressure vis-à-vis experience and confirmation,” which is Roland’s (2013, 48) favoured interpretation of the remark.

¹¹ Those who insist on calling this a methodological naturalism should at least adopt Amanda Bryant’s distinction between the “emulation thesis” (2020b, 47) of methodological naturalism (what is here denoted ‘methodological scientific naturalism’) and the “implementation thesis” (2020b, 48) of methodological naturalism (what is here denoted ‘ontological scientific naturalism’).

According to this interpretation, Quine's naturalism can be seen as a particularization of the kind of naturalism that is captured by Sellars' emphasis on opposition, the prominence of nature, and knowing in nature. When Quine calls for epistemology to be naturalized, he follows Sellars' insistence that epistemology in particular must be sensitive to the fact that knowing occurs in the world that science studies and makes discoveries about. Likewise, Quine's vision for ontology is in tune with Sellars' view that ontology should depend on and be concerned with "the world-view growing out of science." For Quine as for Sellars, these are part of one naturalism. Indeed, Hilary Kornblith pays homage to Quine for the insight that a naturalistic epistemology and naturalistic metaphysics must be integrated. One way this is manifested, Kornblith argues, is in the naturalist epistemological view that "there simply is no extrascientific route to metaphysical understanding" (1994, 40). This view will prove important for naturalized metaphysics, but it is instructive to briefly see how Quine actually takes this integration between naturalistic epistemology and metaphysics quite a bit further.

Quine is explicitly realist with respect to science *and* with respect to the ontological commitments that the indispensability argument derives from science. These entities are real whether they are observable or theoretical entities (and even if they are abstract entities, though with some reservation).¹² Indeed, Quine insists that this is a "robust realism" (Quine 1981, 21; quoted in Hylton 1994). We might imagine that this confident realism relies on some argument that the predictive and technological successes of science prove that the ontological commitments derived from science are likely to be true; they reflect what the world is really like. However, Quine also argues that philosophy is continuous with science and particularly rejects the view that philosophy – through questions such as that about the epistemic status of science – is prior and external to science or any other inquiry. Such an epistemic argument for realism with respect to science and its ontological commitments would be inadmissible by Quine's own standards. Instead, Quine's realism is robust precisely because he argues that there is no place from which it can be questioned. He does not directly defend this view on the basis of his naturalized epistemology. Rather, both the robust realism and naturalized epistemology floats from Quine's broader naturalism (as also indicated by Haack (1993)). As Peter Hylton summarizes the point, "[w]hat is crucial to Quine's naturalism is the negative point, that there is no theoretical perspective other than the general perspective of natural science – and, in particular, no distinctly philosophical perspective" (Hylton 1994, 267; see also Gibson 1992; Alspector-Kelly 2001). This

¹² Quine has some reservation about abstract entities, but this view seems to be in some tension with Quine's naturalism (Alspector-Kelly 2001). We shall therefore not consider this nominalism any further here.

is then why the realism is unquestionable and unqualified: “to defuse the threat of the question whether our scientific system of the world [...] might nevertheless fail to be true, Quine must insist that the questioner cannot occupy a position which is wholly outside our system of the world” (Hylton 1994, 267). Quine is, in a sense, taking Sellars’ view that we are part of nature to the extreme. As part of nature, we are already embedded in the web of beliefs about this nature and an inquiry about the web’s relation to reality would require an external point of view which we simply do not possess (and can hardly even meaningfully talk about). From within this system, we can ask whether a particular theory is true or whether some element exists but asking about the truth of the system as a whole is meaningless. This is a semantic (and not an epistemic) argument to the effect that it is meaningless to question whether the ontological commitments derived from science *really* exist, if ‘really’ is meant to move the discourse beyond science into some metaphysical realm.¹³ Metaphysicians’ debates about what is *really* real are therefore semantically defective or, as Quine puts it, “[w]hat evaporates is the transcendental question of the reality of the external world – the question whether or how far our science measures up to the *Ding an sich*” (1981, 21–22, emphasis in original).¹⁴ Quine’s realism is in this sense robust and, we might add, without need for qualification because it is unquestionable and without conceivable alternatives. Following through on naturalism entails, for Quine, that philosophy – and ontology in particular – can do no better than being based on science. It does not get any more real.

Also Sellars argues that realism is part and parcel of naturalism by appeal to the view that we as knowers are part of nature. According to his version of the argument, the commitment of naturalism to regard humans and their capability for knowledge as an evolved feature forces the adoption of realism with respect to the world where adaption took place. For Sellars, “*realism is simply part of the Darwinian paradigm and is not a metaphysical ‘extra,’*” as Slurink (1996, 428) summarizes it. Once we have adopted naturalism, it is not an extra step to endorse realism since naturalism and particularly its commitment to Darwinian evolution would be next to incoherent without a belief in a mind-independent external world. The result is a “hypothetical realism” and with its origin in

¹³ We can of course still ask whether something is really there, but without the metaphysical aspect, such questions can only be used to signify that for instance the naked eye is prone to be mistaken about distant objects and inquire whether the object is still there if I look again through binoculars.

¹⁴ In this way, Quine seems to endorse a type of empirical realism as developed by Feigl (1950). See Psillos (2011) for a more recent discussion of empirical realism and why it might serve for a “scientific realism without metaphysical anxiety” (2011, 303). However, as I argue elsewhere, such an empirical realism seems to be nothing but instrumentalism in disguise (Jaksland 2017).

science, Sellars does not regard it as in need of independent justification. Rather, he argues that the burden of proof is on those who reject it to produce a coherent alternative. Sellars thus recognizes the conceivability of alternatives to this realism, but this also allows him to emphasize that his realism is a belief in a mind-independent external reality where the evolved capacity for knowing takes place. On this view, we can ask whether something is *really* real, and the answer depends on whether the feature inquired about is part of the furniture of this mind-independent reality. Thus, while both Quine and Sellars argue that naturalism comes pre-equipped with realism, Quine's radical implementation of naturalism renders Sellars' qualifications of realism meaningless, at least if they are meant as an answer to "the transcendental question of the reality of the external world," as Quine puts it above. Quine, in this sense, goes further than Sellars and argues that being always embedded in the world system entails that there is nowhere from which to qualify the realism associated with naturalism. As Mark Alspecter-Kelly (2001), Huw Price (2009), Gideon Rosen (2014), among others point out, Quine's "robust realism" is as a consequence a deflationary metaphysics in disguise. Quine seems to be largely in agreement with Carnap's (1950) deflationary view of metaphysics, the only difference being Quine's rejection of pluralism and insistence on the preference of the scientific framework.¹⁵ Sellars' realism in contrast is more inflationist than Quine's and will consequently be more hospitable to metaphysics. With this inflationary realism, however, comes the question of why science is epistemically preferable, a question that Quine claims he avoids.

Through the indispensability argument, Quine (1948) promises a way to do ontology – or at least for determining our ontological commitments – without leaving the scientific route (chapter 4 will return with an assessment of whether this promise can be fulfilled). After the hostility towards ontology due to logical positivism, Putnam finds that "[i]t was Quine who single-handedly made Ontology a respectable subject" with the publication of 'On what there is' (2004a, 78–79). This was true of naturalist and non-naturalist ontology alike. However, the deflationary realism adopted by Quine entails that "Quine is not returning to the kind of metaphysics rejected by the logical empiricists. On the contrary, he is moving forwards, embracing a more thoroughgoing post-positivist pragmatism" (Price 2007, 393). Quine is consequently an odd champion for metaphysical inflationists, naturalized or otherwise. The occasional association of naturalized metaphysics with Quine's naturalism has therefore led to some misunderstanding of the attitude towards metaphysics in naturalized metaphysics. The next chapter aims to sort some of these out by

¹⁵ As Price (2007) argues, it is questionable whether this preference for science is actually tenable by Quine's own standards.

clarifying how the naturalism of naturalized metaphysics differs from Quine's and more generally detail how naturalized metaphysics promises to be a genuine inflationary exercise in metaphysics.

3 THE PROMISES OF NATURALIZED METAPHYSICS

3.1 THE QUINEAN CONNECTION

Also Ladyman and Ross recount a story of how Quine – though arguably unintentionally – revived metaphysics (with the help of Kripke, Putnam, and Lewis). “Initially,” Ladyman and Ross note approvingly, “this sort of metaphysics could be indulged in guiltlessly by philosophers who admired the positivists, because it was profoundly respectful of science” (2007, 9). However, with metaphysics out of the box, the bonds to science deteriorated, helped along by the growing consensus that “science, usually and perhaps always, underdetermines the metaphysical answers we are seeking” (2007, 9). Quine’s (alleged) defeat of logical positivism and this underdetermination of metaphysics by science – which Ladyman and Ross also recognize – made metaphysicians increasingly bold. It was a trend where “increasing numbers of philosophers lost their positivistic spirit” (Ladyman and Ross 2007, 9). Slowly this has led to a “rise to dominance of projects in analytic metaphysics that have almost nothing to do with (actual) science” (Ladyman and Ross 2007, 10). Ladyman and Ross make no contention that Quine would have blessed this development. Rather to the contrary, they insist that “it is in the spirit of the positivists that we can say, with Quine, ‘philosophy of science is philosophy enough’” (Ladyman and Ross 2007, 8). Nevertheless, Ladyman and Ross disparagingly find that most debates in analytic metaphysics, at the time of writing, “seem to presuppose that science must be irrelevant to their resolution. They are based on prioritizing armchair intuitions about the nature of the universe over scientific discoveries” (2007, 10). This “neo-scholastic metaphysics”, as Ladyman and Ross (2007, sec. 1.2) polemically call it, is their occasion for naturalistic opposition. They call for a return to the positivistic spirit where metaphysics is “profoundly respectful of science” and “philosophy of science is philosophy enough.” From this story, one might, in other words, get the impression that Ladyman and Ross seek a revival of Quine’s naturalism.

This impression is only strengthened when Alyssa Ney proposes a version of naturalized metaphysics – what she calls “neo-positivist metaphysics (metaphysics that is informed by and inherits the justification of science [...])” (2012, 72) – that can serve “as an antidote to some of the more draconian proposals for what a metaphysics must be if it is to escape the charges of the positivists such as that found in Ladyman and Ross’s (2007) book *Every Thing Must Go*” (2012, 54). Ney’s recognizes that her neo-positivist metaphysics also “owes much to the meta-ontology of Quine” and “finds its inspiration in the work of Carnap and the logical positivists” (2012, 54), but it does apparently not go as far as Ladyman and Ross in the endorsement of logical positivism. Nevertheless,

Ney express the “hope [...] to have outlined how a version of metaphysics may survive the genuine worries the positivists had about metaphysics” (2012, 76). As chapter 4 argues, it is in my view doubtful that neo-positivist metaphysics can fulfil this promise. Indeed, I argue there that no ontological scientific naturalism – irrespective of how strict it is – will provide any resources with which to counter the worries that Carnap (and Quine) had about metaphysics. Presently, the point is merely that Ladyman and Ross in part, but Ney in particular, amplify an unfortunate image of naturalized metaphysics through the association with logical positivism and Quine; something that of course is only worsened when Ney describes Ladyman and Ross’ approach as even more positivistic than her own.

Especially Carnap’s work on metaphysical methodological has become increasingly influential recently and unsurprisingly, it has in particular been promoted by those who seek to *end* (parts of) the metaphysical practice (e.g. Price 2013; Chalmers 2009; Yablo 1998). With remarks such as that of Ney above, naturalized metaphysics easily comes to be associated with this eliminative view of metaphysics that is trending in contemporary metametaphysics. Indeed, this conception of naturalized metaphysics is especially widespread among its critics. Morganti and Tahko say that they will “look at some more deflationary, or even eliminativist, recent proposals [...], with special attention to Ladyman and Ross (2007)” (2017, 2561).¹⁶ Woudenberg et al. claims that “[t]he spirit of positivism lives in anti-metaphysical and anti-theological stance of scientism, as is obvious from [...] Ross and Ladyman’s scientism” (2018, 10). Ladyman and Ross, however, rather clearly distance themselves from such a view: “We cannot go back to anti-metaphysical positivism. This book is not hostile to metaphysics; indeed, it is an exercise in metaphysics” (Ladyman and Ross 2007, 26). In itself, this is not very telling since exercises in metaphysics are also pursued under Carnap’s banner, Amie Thomasson’s (2015) easy ontology being a prime example, and we might even construe Quine as promoting a metaphysics that at least preserves a Carnapian spirit. Common for these is that they adopt a deflated notion of reality and thus a deflated view on the subject matter of metaphysics. Quine’s Carnapian spirit is seen when he – as discussed above – rejects as meaningless any questioning of whether the ontological commitments derived from science really reflect the reality of a “*Ding an Sich*” and likewise, Thomasson – despite clearly answering ontological questions – argues that her easy ontology “leads to a kind of meta-ontological deflationism, holding that something is wrong with typical ontological disputes about what really exists” (Thomasson 2015, 22). Following Carnap (1950), Thomasson (2015, 71–75) gives the example of a

¹⁶ Morganti and Tahko (2017, 2568) later clarify that the naturalized metaphysics defended by Ladyman and Ross is not after all eliminative of metaphysics.

nominalist and a Platonist who debate the existence of numbers. While both parties can agree that there is a certain sense in which there is a prime number between 6 and 10, namely the number 7, they nevertheless disagree whether numbers really exist or not. The nominalist and Platonist might be construed as disagreeing whether the term ‘prime number’ actually refers to something in mind-independent reality. They debate the relation between language and world but in doing so, as Thomasson observes following Price’s (2009) interpretation of Carnap, they are at the same time trying to be external to language while obviously using it for their debate – which simply seems incoherent. This is, in other words, an example of arguing that this kind of metaphysical debate about what is metaphysically real is semantically problematic. Thomasson, Price, and Carnap are not rejecting that there is a mind-independent reality that language can “carve at its joints” (Sider 2011, vii) but rather arguing that such claims about joint-carving are meaningless. From this, Thomasson argues that ontology is easy since it follows trivially from the fact that there is a prime number between 6 and 10 that there are numbers and likewise for properties from the fact that there are red houses and that red is a property: “we should simply say that such entities exist—full stop—and adopt a simple realist view of them” (Thomasson 2015, 146). Elsewhere Thomasson qualifies, almost in an echo of Quine, that simple realism is “realism *in the only sense the relevant terms have*” (Thomasson 2015, 136, emphasis in original).

Perhaps the charge of positivism against naturalized metaphysics in general and Ladyman and Ross in particular is warranted because their “exercise in metaphysics” assumes this type of metaontological deflationism? If so, naturalized metaphysics would after all be part of the recent trend in metametaphysics of reconstruing the content of metaphysical debates though, if the reception of Thomasson’s easy ontology is anything to go by (see van Inwagen (2020) in particular), most metaphysicians cannot recognize what they are attempting to do in these proposals (see chapter 6 for a discussion). If naturalized metaphysics is guilty as charged, naturalized metaphysics may not be genuine metaphysics by the standards of most metaphysicians, but rather offer a deflated ontology like Quine’s. However, Ladyman and Ross, and with them the other proponents of naturalized metaphysics (apart from Ney), rather clearly distance themselves from these semantic concerns about metaphysics and the related questions about meaningfulness. Ladyman and Ross do endorse a type of verificationism that we shall return to shortly but qualify that “our verificationism, unlike that of the logical positivists, is not a claim about meaning” (Ladyman and Ross 2007, 30) and elsewhere they describe their project as “distinguishing well-motivated from ill-motivated metaphysical proposals; we do not seek a principle for separating sense from nonsense” (Ladyman and Ross 2007, 34). Likewise, Katherine Hawley begins her defense of

naturalized metaphysics by remarking that she “will disregard those sceptics who argue that non-empirical claims are meaningless” (Hawley 2006, 453). These remarks, of course, are directed at the logical positivists’ and other empiricists’ empirical criterion of meaning which at least on Thomasson’s (2015, 40) construal is independent from the reasons that she, following Carnap, gives for the rejection of metaphysical realism. However, the only mention of any kind of deflated realism among proponents of naturalized metaphysics is Hawley’s mention of “conceptual-scheme relativism” according to which “seemingly-rival metaphysical views are different but ultimately compatible ways of describing the same underlying reality” (Hawley 2006, 253). This view is arguably closer to quantifier variance (e.g. Hirsch 2002; 2009) and generally pluralist interpretations of Carnap (e.g. Eklund 2012; 2013) but even so, it is perhaps indicative of the broader attitude among proponents of naturalized metaphysics when Hawley continues: “While I reject this relativism, it is not a threat to the project of this paper” (Hawley 2006, 253). Despite the admiration for Quine found among some proponents of naturalized metaphysics, they do not seem to endorse the aspect of his naturalism that calls for a deflated realism. Indeed, naturalized metaphysics seems to endorse metaphysical realism and thus a more inflationary conception of (the subject matter of) metaphysics. Even Ney concludes that her variant of naturalized metaphysics “is the only legitimate place to begin if one is trying to accomplish at least one of the main tasks metaphysicians set for themselves—to establish conclusions about ultimate reality” (2012, 76) and Ladyman and Ross argue that “no other sort of metaphysics counts as inquiry into the objective nature of the world” (2007, 9). Deflationary interpretations of ‘ultimate reality’ and ‘the objective nature of the world’ are possible, so as Hawley remarks a more deflated realism is likely compatible with naturalized metaphysics, but nothing indicates that ‘metaphysics’ in ‘naturalized metaphysics’ is not meant to carry its usual significance. Indeed, Hawley makes very clear that she intends ‘metaphysics’ to follow the use among metaphysicians explicating it as covering “issues of the sort typically discussed by self-described metaphysicians, who work in philosophy departments and publish in philosophy journals” (Hawley 2006, 452) and likewise, Amanda Bryant writes that “*metaphysics* is whatever it is that we do in metaphysics anthologies, journal articles, and classrooms” (Bryant 2020a, 3). Despite this liberal construal, though, the exemplars for the subject matter (but importantly *not* the methods) of metaphysics are limited to the work of analytic metaphysicians such as David Armstrong, David Lewis, and Peter van Inwagen, and does not extend to the likes of Immanuel Kant or Martin Heidegger. Furthermore, it seems to be a guiding assumption that science and metaphysics are not distinct for any principled reasons (see Ney (2019) for a discussion from within naturalized metaphysics). Instead, metaphysics is concerned with the fundamental character of the same reality that scientific realists take science to

study though certain metaphysical issues may be prior to or beyond science. The typical issues are as such composition, identity, causation, fundamentality, etc., more than freedom, being, totality, and God.

In giving the work of Armstrong, Lewis, and van Inwagen as examples of metaphysics, naturalized metaphysics also becomes associated with their ambitions on behalf of metaphysics which involve a metaphysical realism that both Quine and Thomasson reject. Indeed, the realism endorsed by proponents of naturalized metaphysics instead comes closer to Sellars' hypothetical realism. For Sellars, this realism is entailed by the commitment Darwinian evolution. There must be a world where adaption takes place and whose nature our cognitive capacities, though imperfectly and arguably only through much sophistication, can therefore reveal. There are objective answers to questions about what is really real – assuming the questions are well-posed¹⁷ – though the answers may of course not be known or even knowable to us. As argued in section 2.3, this realism is not unquestionable in contrast to Quine's "robust realism," but Sellars nevertheless saw no need to independently justify it. Rather, its justification flows from science, or in Sellars case, more precisely from the theory of evolution. The proponents of naturalized metaphysics do not emphasize this particular argument from the theory of evolution, but they seem to share in the idea that the justification for realism flows from science more generally. Focusing more particularly on physics, Ney writes:

the relevant semantic and epistemological claims I mean to endorse here are only the following. First, the claims of our best, fundamental physical theories are meaningful. Second, the claims of our best, fundamental physical theories are justified. How they come to be justified, how they come to be accepted in the first place: these are issues that this account of methodology in metaphysics need not take a stance on. The point is that physics has a proven track record of success making it a good place to begin metaphysical inquiry (Ney 2012, 62).¹⁸

The argument, like Sellars', seems to be that the burden of proof lies with those who, despite the predictive and technological success of physics, will deny that

¹⁷ Questions about whether a feature is really real might not always be well-posed due to complications relating to "domestication" (see section 3.3 for further details). However, the point is that such questions are not in general problematic, though they can prove to be so on a case-by-case basis.

¹⁸ A Quinean reading of this passage is arguably available but as argued in chapter 4, this does not fit with what Ney otherwise write, though she does express her sympathy for Quine.

physics is about a mind-independent reality (the semantic part)¹⁹ and that its theories make justified claims about this reality (the epistemic part). If metaphysics can inherit these credentials, then it will also be possible to have justified *metaphysical* beliefs about this reality (more on how this is achieved in the subsequent sections). Ladyman and Ross' (2007, sec. 2.1.1) discussion of (scientific) realism only explicitly concerns the epistemic part, focusing on Putnam's no-miracles argument: "The positive argument for realism is that it is the only philosophy that doesn't make the success of science a miracle" (Putnam 1975, 73). This is a global argument for the epistemic standing of science since it considers the *collective* success of science and uses it to argue that science *typically* makes (approximately) correct claims about reality, though individual theories of course remain fallible. However, already in discussing this argument, Ladyman and Ross distance themselves from Quine who denied the very possibility of such global inquiries into the relation between science and the world whereby the no-miracles argument would be meaningless. Ladyman and Ross are not opting for Quine's deflationism but instead take up the challenge to provide a global justification for scientific realism which in turn allows for a genuine metaphysical realism for naturalized metaphysics following the argument explicated by Ney above.

When naturalized metaphysics is nevertheless sometimes associated with Quine's deflationary view of metaphysics, it is perhaps because that such deflationary views are often specified in terms of what the metaphysical practice cannot include rather than through their opposition to other forms of realism. This is with good reason, as Hylton points out, since "[o]nce one begins to argue against the coherence of some form of realism – external realism or transcendental realism, say – it is almost too late to deny that there is any sense to such an idea" (1994, 264). For this reason, Hylton speculates, the passage also quoted above where Quine rejects "transcendental question of the reality of the external world" is the closest Quine gets to specifying his realism in contrast to others. His preferred strategy is instead to be puzzled about philosophical inquiries into his realism and to reject that there is any substantive philosophical debate to be had about it or that it needs further qualification. Also Thomasson avoids contrasting her meta-ontology with metaphysical realism directly and instead more often opts for qualifications in terms of what the metaphysical

¹⁹ Arguably, this is a conjunction of the metaphysical and semantic aspect of scientific realism following the terminology of Stathis Psillos (1999, xviii). However, since realism with respect to unobservables is irrelevant for present purposes, 'semantic' will be used to denote the joint aspect that has to do with what scientific theories in general are about. This semantic aspect is, in other words, concerned with "the question whether or how far our science measures up to the *Ding an sich*," as Quine puts it, i.e. with the question that "dissipates" according to Quine's robust realism; a view that also Thomasson shares.

practice cannot involve, arguing for instance that “answering existence questions [...] involves nothing ‘epistemically metaphysical’ nor any distinctively *philosophical* enterprise of figuring out *what really exists*” (Thomasson 2015, 158, emphasis in original). As we shall see, the criticism of autonomous metaphysics within naturalized metaphysics could be summarized as making a similar point, though emphasizing ‘epistemically metaphysical’ rather than ‘what really exists’. This difference, however, is important since it marks a difference between Thomasson’s (and Quine’s) semantic reasons for this conclusion which should be kept apart from the epistemic concerns that gets naturalized metaphysics there.

3.2 A NATURALIST CRITIQUE OF THE TRADITIONAL METHODS OF METAPHYSICS

Even though naturalized metaphysics does not share Quine’s deflationary realism, the naturalism that got Quine there with its specific emphasis of philosophy being part of nature is nevertheless central also to the naturalism of naturalized metaphysics. As sketched already, naturalized metaphysics is a reaction to the rise of a metaphysics in the analytic tradition that attempts to answer questions about objective reality without paying sufficient heed to science. Instead, this neo-scholastic metaphysics is based on a priori reasoning, intuitions, common sense, and conceptual analysis, but these traditional methods of metaphysics, proponents of naturalized metaphysics argue, are not to be relied upon because of their place in nature as evolved human capacities.

Ladyman and Ross implicitly charge Quine of making these traditional methods of metaphysics naturalistically respectable: “Quine (1969), in arguing for the naturalization of epistemology, claimed that the evolutionary processes that designed people should have endowed us with cognition that reliably tracks truth, on the grounds that believing truth is in general more conducive to fitness than believing falsehood” (Ladyman and Ross 2007, 2). Those with sounder intuition and better habitual inference patterns will tend to survive and these traits are therefore more likely to be passed on to later generations. By this argument, the traditional methods of metaphysics might be considered reliable, but only, Ladyman and Ross argue, in the domain that comprised the evolutionary pressure on our cognition. Evolution has designed our cognitive capacities for events and objects that we encounter here on Earth. Our cognitive capacities thus are adapted for “making navigational inferences in certain sorts of environments (but not in others), and [...] anticipating aspects of the trajectories of medium-sized objects moving at medium speeds” (Ladyman and Ross 2007, 3). Whether this even qualifies as reliably tracking truth in this domain is questionable. An indication of this is that our intuitive physics is closer

to an impetus theory of motion than to Newtonian mechanics, a difference that is of little consequence in many situations but leads to significant deviations in others (see Kubricht et. al (2017) for a review of intuitive physics). This impetus-like intuitive physics apparently strikes the best evolutionary balance between accuracy and computational simplicity (Mahr and Csibra 2022). While this example concerns physics, Pascal Boyer (2000) argues that the same process equipped us with an “evolved metaphysics.” However, this should presumably be just as (un)reliable as our intuitive physics. To this, Paul Humphreys (2013, 58–62) adds that intuitions and inferential patterns differ between people.

Matters only get worse when we move beyond the domain where our cognitive capacities evolved. Ladyman and Ross give as examples the rejection of Euclidean geometry (2007, 11) and the discovery of entanglement with its associated challenges to locality and separability (2007, 19). For further examples, Ladyman and Ross refer to Lewis Wolpert’s *The Unnatural Nature of Science* (1992), and Bryant (2020a, 1875) adds as further evidence the more recent findings of Shtulman and Harrington (2016) of several metaphysical intuitions that prove to impede science learning (see also Shtulman (2017) and Gelman and Marchak (2019)). Any study of reality that is based on these evolved features is thus “ignoring the fact that science, especially physics, has shown us that the universe is very strange to our inherited conception of what it is like” (Ladyman and Ross 2007, 10; see also Humphreys 2013, 56–58). Ladyman and Ross do recognize that one could gain insight from investigating for instance our intuitive theories, however, “philosophers who speculatively elaborate on intuitions *might* [...] be interpreted as doing introspective anthropology. Obviously, this would not be metaphysics—the attempt to discover general *truths* about the objective world” (Ladyman and Ross 2007, 14, emphasis in original). These evolved features that characterize our cognitive capacities could perhaps be regarded as a noisy signal about our historical evolutionary pressure which in turn would be a noisy signal about the world where this evolution took place, but for Ladyman and Ross this does not qualify as metaphysics. Referring specially to conceptual analysis, they ask rhetorically: “But why should we think that the products of this sort of activity reveal anything about the deep structure of reality, rather than merely telling us about how some philosophers, or perhaps some larger reference class of people, think about and categorize reality?” (2007, 16). If our interest is “the deep structure of reality” then neither conceptual analysis nor intuitions, common sense, or a priori reasoning will serve us; as they conclude: “there is no reason to imagine that our habitual intuitions

and inferential responses are well designed for science or for metaphysics” (Ladyman and Ross 2007, 3).²⁰

The criticism that Ladyman and Ross raise against the traditional methods of metaphysics and which is variously endorsed by other proponents of naturalized metaphysics is that these methods are *epistemically* unreliable both for purposes of metaphysical actuality and possibility. The place of these methods in the natural world as revealed by science shows that they cannot be used to *justify* metaphysical beliefs. Importantly, this emphasizes that the problem is not that beliefs formed by the traditional methods of metaphysics are meaningless. Nevertheless, the consequence for the traditional practice of metaphysics is very similar to that proposed by Thomasson when she finds that there are no epistemically metaphysical means with which to uncover reality. Indeed, Ladyman and Ross would likely agree with Thomasson in “seeing prolonged philosophical debates about what *really exists* as pointless” (2015, 128), at least if these debates proceed by such epistemically metaphysical means. Ladyman and Ross can agree with Thomasson that there is something wrong with the debate between nominalists and Platonists in the format they are typically having it. The similarities, however, end there. Thomasson’s semantic arguments for this conclusion are very different from the naturalist arguments that lead Ladyman and Ross to an epistemic version of this conclusion. Without this semantic dimension, however, Ladyman and Ross also distance themselves somewhat from Quine. Where Quine takes naturalism to imply that there is no point of view from which to ask what the world is like beyond science, Ladyman and Ross merely give a naturalist argument to the effect that there are no epistemically legitimate resources with which to answer such questions that go beyond science. As argued above, this entails that the realism of naturalized metaphysics is more akin to that of Sellars. Likewise, we can now add, the criticism of the traditional methods of metaphysics in naturalized metaphysics is more in tune with Sellars’ evolutionary naturalism than with Quine’s. For Sellars, a central pillar of naturalism is the recognition that there is only one nature, the one revealed by science, to which also human beings including the philosophers

²⁰ One fallback position for metaphysics that Ladyman and Ross consider is that metaphysics might not be in the business of finding out about actuality, but that it is rather aiming to decide what is necessary and possible (leaving the actual to science). Ladyman and Ross (2007, 16), however, argue that metaphysics has a very bad track record with its claims about possibility and necessity, and this will therefore not do as its subject matter either. Though as for instance Morganti (2016, 87) argues, it is questionable whether science has been any more reliable in its judgements about possibility and necessity. The view of naturalized metaphysics on claims about metaphysical possibility is discussed in a little more detail in chapter 6.

belong.²¹ We must therefore be sensitive to what science reveals about what philosophy can be. As also quoted above, Sellars argues that “philosophy is forced to consider those capacities and processes which make it possible” (1921, 250). Ladyman and Ross, we might say, do precisely that and find that the traditional methods of metaphysics by their evolutionary origin furnish no faculty with which to uncover the deep structure of reality.²² Our capacities do not match our philosophical ambitions in this case. As discussed in the previous section, both Quine and the logical positivists would agree with this conclusion, but their reasons for doing so comes with deflationary semantic views that we do not find in naturalized metaphysics. Like Kornblith, naturalized metaphysics limits the inheritance from Quine to his view that there are no extrascientific routes to insights about reality.

The criticism of the traditional methods of metaphysics have been questioned from several sides. However, the central argument that naturalism challenges the traditional methods of metaphysics is largely left alone, though it is implicitly questioned when for instance Laurie Paul (2012) observes that science employs the very same methods. Beyond the debate about naturalized metaphysics, however, some have placed more confidence in our evolved cognitive capacities for purposes of metaphysics. They do not doubt the evolutionary origin of these cognitive capacities, but they follow the view that Ladyman and Ross attribute to Quine above that precisely this origin makes them worthwhile to consider “as a naturalistic source of metaphysical knowledge,” as Steve Stewart-Williams (2005, 795) puts it.²³ This optimism about our epistemic potential is based on arguments that, though evolution selects for fitness, it does indirectly care about truth (Boudry and Vlerick 2014; Griffiths and Wilkins 2015). As Stewart-Williams also recognizes, this does make our cognitive capacities fallible, but this is not the same as saying that they are without utility even for purposes in metaphysics and elsewhere:

There are an unlimited number of possible theories, most of which are wrong, and although any evolved contributions to our view of the world are also likely to be wrong, we may get closer to the truth by accepting these contributions as first approximations than by simply rejecting them, at least in the absence of compelling reasons to do so. Furthermore, where

²¹ Elsewhere in a characterization of his scientism, Ladyman explicitly make this point without, however, mentioning Sellars: “we ourselves and our cultures and societies are part of nature” (Ladyman 2018, 113).

²² Cian Dorr (2010) has argued that metaphysics does in fact not employ these methods. Instead he suggests that appeals to for instance intuitions in metaphysics should merely be regarded as a way of stating presumptions (see Maclaurin and Dyke (2012) for a discussion).

²³ See also Jenkins (2013) for a naturalistic defense of a priori reasoning.

science cannot speak, our first approximations may also have to stand as final approximations (Stewart-Williams 2005, 810–11).

Especially for questions where our evolved capacities are the only means of an answer, these capacities will have to suffice. An understanding of metaphysics as the study of that which is beyond physics (and science in general) would suggest that most of metaphysics would fall in this category.

Nothing indicates that Ladyman and Ross reject that our evolved cognitive capacities are approximately truth tracking in certain domains, but they nevertheless deny the traditional methods of metaphysics that are tied to these cognitive capacities any epistemic legitimacy. In metaphysics at least, these methods cannot serve to establish a first approximation, apart perhaps as playing a role in the context of discovery, and they can certainly not be the basis for any final approximation irrespective of whether there are other means of answering. Their reason is in part, as stated above, that metaphysics in their view has little or no overlap with the domain where our evolved cognitive capacities might be approximately truth tracking. However, from a more general perspective their reason seems to be that these methods are simply too unreliable in absolute terms to warrant belief. Bryant summarizes this point well, when she argues on behalf of naturalized metaphysics that metaphysics based on the traditional methods is “harmful to the extent that its proponents believe it to be an epistemically adequate form of inquiry that produces justified theories about the nature of the world” (Bryant 2020a, 17–18). The problem is that these methods on their own come short of justifying belief in such theories. Both Humphreys (2013, 70–72) and Anjan Chakravartty (2007, chap. 3) aptly spell out the problem in terms of the epistemic risk that is involved in using the traditional methods of metaphysics. While any attempt to theorize about the nature of the world will involve some epistemic risk, this risk is simply too large if the theory is solely based on the traditional methods of metaphysics. Now Humphreys (2013, 70–71) defends this view from a principle of risk aversion – i.e. a principle according to which we should always seek to reduce our epistemic risk – and argues that this leaves “scientific ontology” much better off than “speculative ontology.” However, if the aim is only to reduce epistemic risk *as much as possible*, then this argument might actually vindicate Stewart-Williams’ proposal that our evolved cognitive capacities can be our final approximation in cases where science is silent. Chakravartty’s proposal is more elaborate and details various factors that are relevant for the assessment of epistemic risk, but for present purposes Chakravartty’s framework is helpful because it proposes a continuum of riskiness on which we – admittedly somewhat arbitrarily – introduce a boundary between acceptable and unacceptable epistemic risk. This

seems to be the view also endorsed by Ladyman and Ross with a placement of this boundary such that the traditional methods of metaphysics do not warrant (metaphysical) belief because they involve too big an epistemic risk. As detailed above, their reasoning is that the subject matter of metaphysics has no overlap with the regime where these methods are even approximately reliable, and they therefore completely lack epistemic credibility for metaphysical purposes. As a consequence, however, naturalized metaphysics must provide an epistemically safer approach if it is to stay true to its promise of being an exercise in metaphysics.

3.3 A METAPHYSICS INSPIRED AND CONSTRAINED BY SCIENCE

In a sentence, the positive program of naturalized metaphysics is captured the remark that “[n]aturalism requires that, since scientific institutions are the instruments by which we investigate objective reality, their outputs should motivate all claims about this reality, including metaphysical ones” (Ladyman and Ross 2007, 30). The distinction, as Chakravartty describes it, is that “[n]aturalized metaphysics is metaphysics that is inspired by and constrained by the output of our best science. Non-naturalized metaphysics is metaphysics that is not so inspired or constrained” (2013, 33). In emphasizing that naturalized metaphysics should be “inspired” and “informed” by the outputs of science and that these should “motivate all claims about this reality,” naturalized metaphysics is more committing than the view that “[i]f there is a contradiction between the physics and the metaphysics, then the metaphysics must give way” (Bird 2007, 8). Indeed, the weaker notion that metaphysics cannot contradict science is even endorsed by Jonathan Lowe – one of Ladyman and Ross’ prime targets in their criticism of neo-scholastic metaphysics – who in one place gives metaphysicians the advice of “opening oneself up to the possibility that one’s claims about the metaphysical features of actuality will be undermined by developments in empirical scientific theory” (Lowe 1998, 26). Though Parmenides, on the grounds of reason, famously argued against the existence of change despite the empirical evidence to the contrary, very few will today defend the priority of philosophical theorizing over the findings of the empirical sciences in cases of direct conflict (more on this in chapter 5).

Naturalized metaphysics, however, goes further than that and argues that metaphysics should be inspired, informed, and motivated by science. This connects back to the topic of epistemic risk: Naturalized metaphysics is aiming at a metaphysics that is epistemically responsible in absolute terms. It must be a metaphysics whose justification is sufficient for belief and the hope is that being deferential to the output or findings of science can secure such justification for naturalized metaphysics. Naturalized metaphysics is, in other words, not content

with limiting epistemic risk; the view implicit in Bird's thesis that metaphysics should not contradict science and whose consequence would be that metaphysics could proceed as before in cases where science has no bearing on the issue in question. With reference back to the issue of the meaningfulness of metaphysical questions, Ladyman summarizes this point writing: "That is not to say that they [Ladyman and Ross (2007)] advocate answering all the same questions that are asked by analytic metaphysicians by different means, since they make it clear that they regard some of those questions as meaningful, but as making insufficient contact with reality to be worth entertaining" (Ladyman 2017, 143). The remark, however, indicates an ambiguity whether it is our metaphysical questions or answers that should be motivated by the output of science. On the former, we should not even *ask* metaphysical question unless asking them is somehow motivated by science, while the latter seems more moderate in allowing for metaphysical questions and instead insisting that we should just refrain from *answering* those where no answer would qualify as being based on science or where science tells us that the question is ill-posed (more on this in section 3.4).

While there is some wavering on this issue in Ladyman and Ross' exposition of naturalized metaphysics, the latter option – that we can ask but not answer all metaphysical questions – seems to fit better with their "non-positivist version of verificationism" (Ladyman and Ross 2007, 29) which is at the foundation of their positive proposal for a naturalized metaphysics. This verificationism consists of two commitments: The first, which shall be the focus presently, is that "no hypothesis that the approximately consensual current scientific picture declares to be beyond our capacity to investigate should be taken seriously" (Ladyman and Ross 2007, 29). The second – of less direct concern here²⁴ but discussed in chapter 6 – claims that "any metaphysical hypothesis that is to be taken seriously should have some identifiable bearing on the relationship between at least two relatively *specific* hypotheses that are either regarded as confirmed by institutionally *bona fide* current science or are regarded as motivated and in principle confirmable by such science" (Ladyman and Ross 2007, 29). Rather than logical positivism, Ladyman and Ross trace this version of verificationism to

²⁴ This second component of Ladyman and Ross' verification is what they denote "the principle of naturalistic closure" (Ladyman and Ross 2007, 37). This will not be discussed any further here since the other proponents of naturalized metaphysics do not share it. Some, even, explicitly denounce it (see, e.g., Maclaurin and Dyke 2012, 299; Melnyk 2013, 94; Morganti 2013, 25). Furthermore, as Dorr (2010) notes, this principle even renders illegitimate arguments against presentism in the philosophy of time from the absence of absolute simultaneity in the special theory of relativity which Hawley (2006, sec. 8), for instance, gives as an exemplar of naturalized metaphysics. Due to this opposition, the principle of naturalistic will not here be considered a part of the core commitments of naturalized metaphysics.

Peirce; or more precisely, we might add based on the discussion of Peirce in chapter 2, to the later Peirce, since Ladyman and Ross are, as always, not concerned with meaning and thus semantics. Instead, the issue is what hypotheses “to take seriously.” While this is arguably a rather vague formulation, the point, following Peirce, might be that science reveals that certain questions are pointless to pursue because our current best understanding of the world indicates that it will be impossible to make any progress towards an answer. This sits well with Ladyman and Ross’s elsewhere writing:

Our verificationism, like all versions of that, is promoted as a bar against seeking explanation where we have good reasons to doubt that it promises anything but temporary psychological satisfaction at the expense of truth. In particular, we deny that there is value to be had in philosophers postulating explananda, without empirical constraint, on grounds that these would make various putative explanans feel less mysterious if they prevailed (Ladyman and Ross 2007, 61–62).

In emphasizing “value”, or the absence of it, and in criticizing explanations that do not promise truth, Ladyman and Ross are here moving towards the pragmatic criticism of metaphysics and philosophy in general found in Peirce. Nothing, however, indicates that they embrace a pragmatist view of truth and consequently, it seems more appropriate to interpret this verificationism as part of their *epistemic* criticism of autonomous metaphysics. When a hypothesis is beyond our capacity for investigation, it is, in other words, not without truth value (as pragmatists might argue), but it rather completely lacks the epistemic justification required to warrant belief. Such a hypothesis is not “making insufficient contact with reality to be worth entertaining” as Ladyman writes above, and this epistemic reason is why it should not be taken seriously. The problem is, as such, not with the metaphysical questions but with their answers when science gives us “good reasons to doubt” that any answer can be justified to warrant belief.

Notice finally that in writing “good reasons to doubt,” Ladyman and Ross admit that these judgements about what questions that can be answered are fallible and implicitly that they might change as our scientific knowledge changes. Had the problem with answering these questions been related to semantics, this fallibility might be difficult to accommodate; it would either involve something meaningless suddenly becoming meaningful (and *vice versa*) or that we could be wrong about meaningfulness. However, since the problem with answering these questions according to naturalized metaphysics is epistemic, it only seems appropriate that the texture of these problems will change with our changing knowledge of the world. This fallibility may, as will be discussed in section 3.5,

be an issue for the epistemic standing of science, but it does not render the naturalism of naturalized metaphysics incoherent. It only shows that naturalized metaphysics is not the thesis that certain specified questions are epistemically illegitimate, but rather a commitment to a science-based way of deciding what questions that it is safe to answer. However, as Sellars also pointed out, this plasticity is no threat to the coherence of naturalism since naturalism “is less a philosophical system than a recognition of the impressive implications of the physical and biological sciences.” For Sellars, this insight was an occasion to criticize the identification between naturalism and a specific thesis such as materialism since this would precisely render naturalism a “philosophical system.” Abandoning this view, Sellars argued, importantly involves the recognition that “the texture and breadth of naturalism will alter as the sciences alter.” Likewise, the quote from Schlick suggested that naturalized philosophy should better be sensitive to instances of “notable upheaval” in science. This is a feature and not a bug in naturalism since it must be integral to being deferential to science that our naturalism changes when science changes. If an alleged naturalized philosophy was not affected by the big changes in science, then this should make us question the genuineness of its naturalism.

In line with Sellars’ naturalism, the general commitment of naturalized metaphysics is that metaphysics (and for Sellars, philosophy generally) should be informed, inspired, motivated, and constrained by the *output* or *results* of science without, however, changing the subject matter of metaphysics. Naturalized metaphysics is, in other words, a proposal for how to go about answering metaphysical questions (and what questions to give up answering): “The distinction between putatively acceptable naturalistic metaphysics and putatively excessive metaphysical inquiry does not concern what these forms of inquiry aim to do [...]. Rather, it concerns how these forms of philosophical inquiry go about achieving these aims” (Chakravartty 2013, 32).²⁵ The naturalization of metaphysics involves the introduction of a new way of doing metaphysics that can replace that based on the illegitimate methods traditionally employed in metaphysics. Given this call for a change of method in metaphysics, it is perhaps not surprising that naturalized metaphysics has sometimes been cast as a methodological naturalism (e.g. Esfeld 2018; Hudson 2016). However, some caution must be taken here: Methodological (scientific) naturalism is, as discussed in section 2.3, often associated with the view that the

²⁵ Similarly, Ladyman insists that “metaphysics should not be abolished but reformed” (2017, 143) in contrast to eliminative programs such as logical positivism. Christian Soto, in a recent survey of metaphysics of science in general, similarly observes that naturalized metaphysics does not “recommend the adoption of a sceptical stance on the viability of metaphysics. Contrary to this, it only imposes restrictions on the way it should be practiced” (Soto 2015, 47).

naturalized subject should adopt the methods of science. Arguably, this is the theme running through discussions of experimental vs. armchair philosophy (e.g. Haug 2014).²⁶ It concerns the degree to which philosophers should apply scientific methods in the attempt to answer philosophical questions. Naturalized metaphysics, however, does not promote the implementation of the methods of science in metaphysics. Rather, naturalized metaphysics requires a deference to the *findings* of science. In the terminology of section 2.3, naturalized metaphysics endorses ontological scientific naturalism. Indeed, the attribution of methodological scientific naturalism to naturalized metaphysics – at least of the strand that emphasizes some scientific method – is at odds with Ladyman and Ross’ “pragmatism” that include the “metamethodological claim [...] that there is no such thing as ‘scientific method’” (2007, 28). Instead, they write, “science is, according to us, demarcated from non-science solely by institutional norms” (2007, 28). Ladyman and Ross have confidence in the *results* of institutional science without, however, promoting some scientific method. Associating their view with methodological scientific naturalism is therefore prone to be misleading. Naturalized metaphysics does, however, have affinities to another variant of methodological naturalism that only alludes to the authority of the methods of science and instead argues that there is no a priori method that can be used to establish theories about a distinctly philosophical domain; the view that “such theories are still synthetic theories about the natural world, answerable in the last instance to the tribunal of *a posteriori* empirical data,” as Papineau (2021) puts it.²⁷ As argued above, this view – especially the rejection of a priori insights into the reality and more broadly the rejection of the traditional methods of metaphysics – is central to naturalized metaphysics. However, adding this as a methodological commitments besides ontological scientific naturalism seems superfluous since the criticism of these methods is (allegedly) based on the findings of science, evolutionary biology in

²⁶ It should be noted that none of the contributions on metaphysics found in Haug’s anthology (Lowe 2014; Papineau 2014; Thomasson 2014; J. M. Wilson 2014) engage seriously with the question whether metaphysics should adopt the method or methods of science. Rather, their interest is in the content of metaphysical assertions and the role played by conceptual analysis and intuitions in establishing such assertions. It is therefore fair to observe that in this respect they overlap with the critique of the traditional methods of metaphysics in naturalized metaphysics.

²⁷ This view also sits well with the argument of naturalized metaphysics that the subject matter of metaphysics does not go beyond that of science (e.g. Dorato 2013, 7; Ladyman and Ross 2007, 30; Maudlin 2007b, 78; Ney 2012, 71). See Ney (2019) for a more detailed discussion and rejection of the possibility that the subject matter of metaphysics might be more “fundamental” than that of science; a view suggested by Dorr (2010), Lowe (1998), and Paul (2012), among others.

particular. It is, in other words, a methodological consequence of ontological scientific naturalism.

One may rightfully question how much contemporary metaphysics that is actually pursued without any consideration of the findings of science, i.e., without some – though arguably varying – endorsement of ontological scientific naturalism. “[I]t is,” as Ladyman and Ross (2007, 17) explicitly recognize, “rare to find metaphysicians [...] arguing that if science and metaphysics seem to conflict the latter may trump the former.” In many cases, however, the problems with the traditional methods of metaphysics raised in section 3.2 remain relevant because the adopted ontological scientific naturalism is so weak that these methods are still central to the actual metaphysical practice. Ladyman and Ross (2007, 13) give the example of Lewis’ use of a cost-benefit analysis according to which the violation of metaphysical parsimony and intuitions are costs that must be considered in the negotiation with the outputs of science. Ladyman and Ross renounce the relevance of such cost-benefit consideration since there, in their view, is no cost associated with the violations on the metaphysical side. Chapter 5 returns to this theme exploring the example of Lewis’ intuitive preference a metaphysics of point sized elements at a spatial distance and how this has been the occasion for negotiation with the findings of several contending theories of quantum gravity where space appears to be absent at the fundamental level of description.

3.4 DOMESTICATION AND OUTDATED SCIENCE IN SCIENCE-BASED METAPHYSICS

Even among those whose work is in the philosophy or metaphysics of science, and who are explicitly motivated by science, two problems remain. First, this work is in some instances based on outdated science; often classical mechanics but a similar issue is identified by Papoulias and Callard (2010, 42) in the use of outdated cognitive science in the affective turn. Sometimes this is the result of ignorance, but often, Ladyman and Ross find, this is done knowingly out of an assumption that “whatever the actual details of mature physics, they will somehow be able to ‘dock’ with the non-actual physics in question at some level of abstraction or generality, so that philosophers need not worry about or even pay attention to those details” (Ladyman and Ross 2007, 19). This assumption, however, is problematic. While it is often the case that the successor to a successful scientific theory must account for this success, typically through showing that the superseded theory obtains as an approximation in some limit of its successor, this offers no vindication that the metaphysics of the superseded theory is even approximately true (McKenzie 2020). Indeed, disparity between the metaphysics of the theories in the scientific line of succession is what drives

Laudan's (1981) pessimistic meta-induction against scientific realism. The kind of ontological scientific naturalism proposed by naturalized metaphysics requires a deference to the findings of our *current best* science: "We might thus say that whereas naturalistic metaphysics ought to be a branch of the philosophy of science, much metaphysics that pays lip-service to naturalism is really philosophy of A-level chemistry" (Ladyman and Ross 2007, 24). This theme recurs in chapter 7 where Karen Barad's worries how the implicit assumption of the metaphysics of classical physics leads social theorizing astray and calls for the adoption of a quantum metaphysics instead.

The second problem that might occur with otherwise science-informed metaphysics is if the scientific theories are distorted for metaphysical purposes. Ladyman and Ross describe this as "domesticating scientific discoveries so as to render them compatible with intuitive or 'folk' pictures of structural composition and causation" (2007, 1). This domestication of scientific theories could, for instance, arise from Lewis' cost-benefit approach in that it also seeks to preserve our metaphysical intuitions. From the perspective of naturalized metaphysics, the problem is as such that domestications again see a role for the epistemically problematic traditional methods of metaphysics.²⁸ In relation to the positive proposal that naturalized metaphysics must be motivated and inspired by science, the problem with domestication can also be seen as involving a violation of this requirement. Though the result of such domestication – at least if it is not too severe – is some form of metaphysics of science, it is one that is motivated by metaphysics rather than science. Ladyman and Ross primarily illustrates the problems with domestication and outdated physics together, again often using classical mechanics as an example. However, it worthwhile to keep these two distinct since one can occur without the other. To illustrate the problem with relying on classical mechanics, Ladyman and Ross offer the analogy that "[n]obody who assumed an Aristotelian distinction between forced and natural motion, and then declared that key parts of what she said about the world were to be understood as placeholders for 'whatever story about proper places and fundamental substances physics eventually says are real', would be taken seriously" (2007, 26). The immediate point is of course that most will agree that this reliance on Aristotelean "science" is problematic. And since classical mechanics is similarly outdated, an appeal to its image of composition and causation in terms of "little things and microbangings" (Ladyman and Ross 2007, 4) is equally problematic in metaphysics irrespective of whether we append the qualification that these are placeholders for whatever elements and interactions science eventually says are real; the assumed ability to "dock" mentioned above.

²⁸ As discussed later in this section, the problem of domestication and that related to the traditional methods of metaphysics are arguably distinct, though they are often intertwined.

The example, however, is also illustrative of domestication. Even if the Aristotelean were to consider current best science as ontological scientific naturalism requires, the result would still be questionable if the findings were approached with the aim to decide which motions are forced and which are natural. Already in classical mechanics – and this has not changed since – this distinction was no longer adequate, and the same could be said of the category of a determinate motion once we get to quantum mechanics. The Aristotelean would be prone to domesticate the scientific findings due to the expectation that these should be understandable or explicable in terms of Aristotelean metaphysical categories. When Ladyman and Ross warn against domestication, they warn against the distortion that our preestablished metaphysical categories may impose on the metaphysics of our best science, if we cling to them.

Ladyman and Ross use this risk of domestication as an occasion to reiterate the point that naturalized metaphysics does not commit to answering all metaphysical question:

An aspect of leaving science undomesticated is recognizing that it itself may tell us that there are questions we absolutely cannot answer because any attempted answer is as probable as any other. This does not imply that we should look to an institution other than science to answer such questions; we should in these cases forget about the questions (Ladyman and Ross 2007, 30).

Even though metaphysical questions should generally be considered meaningful, when posing a metaphysical question to a scientific theory, we should be ready to accept that the scientific theory may tell us that the question cannot be answered. Ladyman and Ross give the reason that this is “because any attempted answer is as probable as any other.” This seems to suggest that the problem merely is that the scientific theory has no bearing on the question; the problem with posing the question ‘which motions are natural (in the Aristotelean sense)’ at for instance Newtonian mechanics is that no answer is more likely than another. However, following the explication of domestication above, the diagnosis of the problem with this question is arguably somewhat different even though the consequence – “that there are [metaphysical] questions we absolutely cannot answer” – is the same. From the perspective of domestication, the problem with the question about natural motion is not that the answers are equally probably but rather that the question does not even apply. While the question is meaningful, it has a built-in metaphysical distinction – that between natural and unnatural motion – which is absent in our current best science. Given our range of current best scientific theories, therefore, what they tell is that this question is ill-posed, not that the answers are equally probable. Rather, the

problem is that none of the possible answers apply to the world as described by those scientific theories. Arguably, metaphysical questions will very often have metaphysical claims built into them. Leaving science undomesticated as required by naturalized metaphysics entails that we must therefore be ready to accept that science will tell us that a metaphysical question rests on inadequate metaphysical presumptions.

This risk of domestication thus leads to the important qualification that even though naturalized metaphysics generally preserves the questions of metaphysics, the details of the scientific theories will reveal that some of them are ill-posed, and others require modification – for instance by stripping some metaphysical presumptions – to be answerable. This negotiation between the metaphysical question and the scientific theory will be illustrated in chapter 5 through the example of Lewisian metaphysics and theories of quantum gravity.

This characterization of domestication as a problem that arises from inadequate preconceptions about a given metaphysical question emphasizes that domestication is in principle distinct both from the problem of outdated physics and from the epistemic concerns raised about the traditional methods of metaphysics. While Ladyman and Ross at places discuss them as though they are different faces of the same problem, it does not appear to be impossible for one to be of relevance without the others, though the reasons for raising these issues *can* be overlapping as is arguably the case for Ladyman and Ross. Take for example those who are otherwise sympathetic to the proposal the metaphysics must take the findings of science into account but who are more hesitant about entirely eliminating the traditional method of metaphysics from metaphysics. Morganti and Tahko (2017), for instance, argue that

metaphysics explores a basic possibility space in such a way that the grounds for the interpretation of scientific theories are laid. At the same time, some elements of science are prior to metaphysics in that science not only contributes to the definition of the basic possibility space itself, but also gathers the indications coming from the actual world that are necessary for fleshing out the various metaphysical hypotheses and selecting the most appropriate [...] among them (Morganti and Tahko 2017, 2575).

In laying out this possibility space – an idea that is inspired by Jonathan Lowe’s (1998) notion that metaphysics is in the business of laying out metaphysical possibilities – Morganti and Tahko defend the need for some metaphysics to be prior to science; metaphysics that must therefore inevitably rely on the traditional methods of metaphysics. While the primary interest here is the more

radical version of naturalized metaphysics endorsed by Ladyman and Ross among others, this “moderately naturalized metaphysics” serves as a good example of the independence of the problem of domestication from the criticism of the traditional methods of metaphysics.

Morganti and Tahko do not dispute that quantum mechanics displays surprising results and that these are relevant for a metaphysics that aims to account for fundamental reality. As such, we must approach quantum mechanics in metaphysics in a way that does not distort its testimony about fundamental reality. Morganti and Tahko will likely argue that our interpretation of this testimony can never be metaphysics-free, metaphysics is after all laying the grounds for such interpretation. They are, however, not thereby arguing that all there is to this alleged testimony from quantum mechanics is the metaphysical preconception that we ourselves put into its interpretation. They are still advocating a science-based metaphysics. Thus, it must be a central aim also for their moderately naturalized metaphysics to avoid distorting the testimony from, for instance, quantum mechanics, i.e., they must aim to avoid domesticating the theory and its results.

For Ladyman and Ross, of course, the exploration the “basic possibility space” that Morganti and Tahko advocate is just another source for domestication that is only amplified by its alleged role in the interpretation of scientific theories. Morganti and Tahko, however, regard this exploration as necessary and thus, we might say, find the risk of domestication from this metaphysical groundwork to be inevitable. One might even argue that domestication should therefore be even higher on the agenda for moderately naturalized metaphysics since it is all the more exposed to this problem once it allows a role for the a priori consideration. Alternatively, Morganti and Tahko’s proposal, along with other similar proposals that are less dismissive of the traditional methods of metaphysics, could be seen as promoting that domestication of the right sort – that which relies on established metaphysical findings – should be welcomed even in science-based metaphysics. This, however, does not exempt these approaches from taking a stance on domestication unless they want to argue that any metaphysical prejudice and its resulting domestication should be welcomed. Thus, the identification of the risk of domestication in science-based metaphysics is an important contribution of Ladyman and Ross’ analysis irrespective of one’s view on their criticism of the traditional methods of metaphysics.

What Morganti and Tahko may not endorse is Ladyman and Ross’ argument that the risk of domestication can require that certain metaphysical questions must be left unanswered. Morganti and Tahko will in contrast argue that science will not have a bearing on all the important metaphysical questions, not even all of

those that form the precondition for interpreting scientific theories. While Ladyman and Ross argue that we – due to the risk of domestication – should not “look to an institution other than science to answer such questions,” Morganti and Tahko argue that we in some circumstances have to do this. But since they are less critical of the traditional methods of metaphysics, they can be more optimistic that we can do so without the risk of domestication becoming too big. This, however, does not change the fact that domestication remains a relevant risk.

Likewise, Morganti and Tahko will presumably echo Ladyman and Ross’ warning against outdated science. If the aim is a metaphysics of fundamental reality and one regards science as a relevant source of information for this work, then it is arguably important to rely on our current best science. Again, this is so even though Morganti and Tahko see an important role in metaphysics for its traditional methods. While the problem of domestication and that of outdated science is, as such, independent from the criticism of the traditional methods of metaphysics, they become intertwined in naturalized metaphysics. After all, they all flow from its naturalism which ultimately comes to the idea – to take the phrase Kornblith uses above to describe Quine’s naturalism – that “there simply is no extrascientific route to metaphysical understanding” (Kornblith 1994, 40). Quine, as argued above, takes this idea quite a bit further than the proponents of naturalized metaphysics, but it nonetheless captures well the naturalism that manifests itself through the criticism of the traditional methods of metaphysics, in the problem of domestication, and in the warning against relying on outdated science. This naturalism entails that we can do nothing else, but therefore also nothing better in metaphysics, than relying on the findings of science. This includes being deferential to the judgement of science on the respective merits of its theories, including which are outdated, and, Ney (2012, 61–62) adds, even on which “alternative formulations” of the current best theories that a naturalized metaphysics should take into account. As chapter 4 and 6 discuss in more detail, there are no means, according to this naturalism, for first laying a metaphysical ground for interpreting scientific theories, as suggested by moderately naturalized metaphysics. Any such metaphysical presupposition will be the occasion for domestication in naturalized metaphysics, though they may perhaps still inform our metaphysical questions as proposed in chapter 5. The naturalized metaphysics advocated by Ney and Ladyman and Ross, among others, must take the scientific theories as they are when it finds them. This is the consequence of their thoroughgoing naturalism. Any metaphysics that does not abide by this naturalism, they argue, cannot be regarded as epistemically credible.

3.5 WHY SCIENCE?

So, if the lack of epistemic credibility is the problem for metaphysics in its traditional autonomous form, then why is science – in the form of ontological scientific naturalism – a solution? Polemically, Simon Blackburn speculates that

philosophy is always something of a free-loader when it comes to continuity with the most prestigious activities. When theology ruled the universities, philosophy and theology were continuous; in the first part of this century, and after the spectacular successes of modern logic, philosophy was deemed continuous with logic; then a little later with linguistics, and now philosophy marches into the future handinhand with science (Blackburn 2002, 76).

What Blackburn suggests is that this deference to science in scientific naturalism is merely an expression of the opportunism that he finds among some philosophers who simply seek “to ally philosophical reflection with the most secure and intellectually privileged elements of the contemporary culture” (Blackburn 2002, 76). Taking a particular interest in metaphysics, Blackburn concludes on these grounds that “[i]t is easy to understand why the naturalistic self-image is so popular. First of all, it answers the question of how metaphysics is possible. It is continuous with science, and, since science is possible, so is metaphysics. Secondly, it allows the philosopher some of the prestige and glory of the scientist” (Blackburn 2002, 76).

While Blackburn obviously intends this as mockery, his remarks largely capture the essence of the argument in naturalized metaphysics why science should be the basis for metaphysics. As Maudlin argues, “metaphysics [...] is the most generic account of what exists, and since our knowledge of what exists in the physical world rests on empirical evidence, metaphysics must be informed by empirical science” (Maudlin 2007b, 78). Since science succeeds as an account of ultimate reality – science is in this sense possible –, then so will a sufficiently (ontologically) naturalized metaphysics. Furthermore, it is arguably because science is regarded as a prestigious enterprise that the naturalists find that it is science that metaphysics should be deferential to. However, the proponents of naturalized metaphysics will maintain that this prestige is well earned. Naturalized metaphysics argues that the history of science has proven science to be a successful enterprise. The success is taken to justify our regard for science as epistemically credible and therefore as the rational starting point for metaphysics. Ladyman and Ross (2007, chap. 2) develops this argument in most detail with their defence of the no-miracles argument. Their defence is based on structural realism but the important point for present purposes is that they even engage in this task of establishing the epistemic credentials of realist science

through “wholesale reasoning about science” (Ladyman and Ross 2007, 74). Doing so can be treacherous since arguments to this effect easily come to depend on the very same philosophical methods that naturalized metaphysics is so critical of, which has, for instance, been argued to be the case for attempts to defend the no-miracles argument (e.g. Psillos 2011; Jaksland 2017; de Ray 2020). Following the reconstruction of Quine’s views above, also Quine worried that such wholesale discussions of the epistemic credibility of science are prone to take the form of the illegitimate “first philosophy.”

Perhaps for this reason, Ney seems to be more cautious to enter discussions of the epistemic credibility of science. Though Ney, as also quoted above, appears to echo Ladyman and Ross when she concludes “that physics has a proven track record of *success* making it a good place to begin metaphysical inquiry” (2012, 62, emphasis added), she also explains to have adopted “a more restrictive approach” to naturalized metaphysics “because the goal is to get out a metaphysics that has established its semantic and justificatory credentials via physical theory itself, without having to also develop a semantic theory and epistemology for physics” (2012, 64). Though Ney mentions both semantic and epistemic credentials, the focus here will continue to be on the latter while issues relating to the former are discussed in more detail in chapter 4. Ney’s proposal seems to be that naturalized metaphysics inherits its epistemic credentials from (realist) science and whoever questions naturalized metaphysics therefore also questions science. On one reading, Ney in turn regards the success of science as sufficient for justifying it as the starting point for an epistemically credible naturalized metaphysics – possibility following Ladyman and Ross’ appeal to the no-miracles argument – but perhaps the point is merely that *if* science makes justified claims about reality, then so does naturalized metaphysics. Naturalized metaphysics stands and falls with realist science, but this view of science is then in turn not further justified. This argumentative strategy still deviates from that of Quine since it as such engages in the question about the epistemic legitimacy, but it may share Sellars’ view – now in an epistemic version – that the success of science places the burden of proof with those who deny science its epistemic legitimacy. Also Ladyman, in one place, seems to endorse this Sellarsian approach when he writes: “Prima facie it is puzzling that although we have successful empirical science, philosophers also carry out a separate form of a priori enquiry into the nature of things” (2012, 32).

On this view, however, there is no argument that secures the epistemic foundation of science and thus of naturalized metaphysics. It therefore leaves open that naturalized metaphysics may not be an epistemically safe approach to metaphysics either. Andrew Melnyk is one of the few proponents of naturalized

metaphysics who considers this possibility explicitly: “I think there is a real possibility that the activity that we call ‘metaphysics’ should turn out not to constitute a viable form of inquiry at all, either empirical or non-empirical” (Melnyk 2013, 81). Melnyk, however, finds that, for purposes of answering metaphysical questions, science is the most (and possibly only) promising ally: “the only possible approach to such a question requires scrutinizing our best current physical theories and working from there” (Melnyk 2013, 94). Melnyk, as such, opts for a view that avoids the challenge of providing a principled argument for the viability of naturalized metaphysics and thus the associated risk that this argument will rely on the problematic traditional methods of metaphysics. Instead, he merely suggests that naturalized metaphysics is superior to other approaches to metaphysics such that if naturalized metaphysics fails, then so do all other approaches. This view also appears to be the view endorsed by Ney, Bryant (2020c, 28), and possibly Ladyman, who elsewhere writes that “science is the worst source of knowledge about the world apart from all the rest” (2018, 115).

Kornblith identifies this line of argument as common to many forms of (scientific) naturalism.

What does have priority over both metaphysics and epistemology, from the naturalistic perspective, is successful scientific theory, and not because there is some a priori reason to trust science over philosophy, but rather because there is a body of scientific theory which has proven its value in prediction, explanation, and technological application. This gives scientific work a kind of grounding that no philosophical theory has thus far enjoyed (Kornblith 1994, 49).

The successes of science, according to Kornblith, do not provide for some a priori argument that can establish the epistemic credentials of science, but they are nevertheless better than nothing. Without anything else to go by, the success of science provides it with “a kind of grounding,” as Kornblith writes, that cannot be contested by any philosophy theory or system, and this might therefore serve as an argument for why science, as suggested by Ney, is “a good place to begin metaphysical inquiry.”²⁹ Given the character of the argument, however, “good” may be a little misleading since the argument suggests that science is only the *best* or least bad place to begin metaphysics. As Melnyk points out, even if science-based metaphysics is best, it may not be good enough. Above, the criticism of the traditional methods of metaphysics was construed as the

²⁹ This argument from the success of science to science-based metaphysics being best is itself rather superficial, and one might worry that further substantiation will reveal that also it depends on elements of the traditional methods of metaphysics.

argument that these methods are too unreliable for purposes in metaphysics and that using them therefore involves too big an epistemic risk. Melnyk's argument could therefore be construed as saying that also science-based metaphysics might be too epistemically risky. So long as the argument in favour of science-based metaphysics is that it is better than metaphysics informed by the traditional methods of metaphysics, it remains a possibility that neither "constitute a viable form of inquiry," as Melnyk puts it.

One might reply that if science-based metaphysics is best, then the epistemic risk will be less than that involved with any other approaches to metaphysics. Thus, if the aim is to answer metaphysical questions, then science-based metaphysics is the best option even though also it may involve an epistemic risk. The problem is that naturalized metaphysics, at least as advocated by Ladyman and Ross, already judge that those questions that cannot be answered based on science should not be answered at all (see section 3.4). Despite the absence of any alternative, we should not resort to the traditional methods of metaphysics because the answers they would produce would be too unreliable to be worth anything. Ladyman and Ross thus very explicitly reject the notion that we should answer metaphysical questions with the best means available. Rather, they argue that we should only answer those metaphysical questions that it is epistemically safe to answer, which they consider to be those where our current best science can inform the answer. This emphasizes why it is important for Ladyman and Ross to give a wholesale argument for the general epistemic credibility of science-based metaphysics.³⁰ It warrants the claim that science-based answers to metaphysical questions are generally epistemically credible. This is not achieved by an argument that only establishes the science-based approach as epistemically safer than the traditional methods of metaphysics. Though science provides a better basis for metaphysics than these traditional methods, this argument cannot establish that science provides sufficient epistemic warrant for answering any metaphysical questions. If one cannot establish the general epistemic credibility of science-based metaphysics, then naturalized metaphysics as well as autonomous metaphysics could both be too epistemically risky forms of inquiry.

This places naturalized metaphysicians in a dilemma. One can either opt, as Ladyman and Ross do, for a wholesale argument for the epistemic credibility of naturalized metaphysics, however, with the risk that such an argument will have to rely on the very same traditional methods in metaphysics that naturalized metaphysics is so critical off. Alternatively, one can opt for the view that the success of science gives some *prima facie* warrant for the view that science-based metaphysics is epistemically superior to other metaphysics which,

³⁰ They of course still recognize that such a metaphysics is fallible

however, leaves the possibility that neither is epistemically responsible undertakings. Proponents of the latter alternative might follow Sellars and argue that the success of science at least places the burden of proof with those who question the viability of naturalized metaphysics. They might even allow this attitude for all metaphysics at the outset but then point to the concerns about the traditional methods of metaphysics raised in section 3.2 as the proof that metaphysics based on these methods is not viable. However, Larry Laudan's (1981) pessimistic meta-induction, Kyle Stanford's (2006) unconceived alternatives, and Kerry McKenzie's (2020) argument that the impossibility of metaphysical approximation impedes naturalized metaphysics could be regarded as providing evidence that also naturalized metaphysics is epistemically problematic. While these are arguably short of a proof that naturalized metaphysics is not viable, they signify that traditional and naturalized metaphysics alike are faced with challenges. If such are sufficient to defeat the former, then they may also be sufficient to defeat the latter.

Relatedly, one may wonder how the difference in epistemic risk between science-based and traditional approaches to metaphysics compares to the risk involved in attempting to answer metaphysical questions in the first place. If the latter risk is much bigger than the difference in risk between the two approaches, then the primary question is arguably whether it is epistemically responsible to engage in metaphysics in the first place and not which method that should be employed when doing so. An argument that only shows that science-based metaphysics is epistemically superior will leave this issue unaddressed. Again, Ladyman and Ross avoid this issue by providing a wholesale argument for the epistemic credibility of naturalized metaphysics, but those proponents of naturalized metaphysics who are skeptical of such arguments – perhaps for naturalist reasons – are faced with several uncertainties regarding the epistemic credibility that threatens to render their position untenable. The literature currently offers little in terms of an analysis even of the relative size of these uncertainties beyond the proposal that science-based metaphysics is epistemically superior to metaphysics based on its traditional methods.

Several authors have pointed out that the traditional methods of metaphysics plays a role in science itself (e.g. Robus 2015; Andersen and Becker Arenhart 2016) and not just in the interpretation of science as for instance Morganti and Tahko (2017) argue. If this is so, then one might worry that it is in any case futile to refer to science in an attempt to solve a legitimacy crisis in metaphysics resulting from the unreliability of these methods. Jonathan Tallant (2013; 2015) goes into more detail arguing that that especially intuitions plays a central role in physics. Laurie Paul (2012) argues that a priori reasoning based on the theoretical virtues that Ladyman and Ross are so critical of in the context of

metaphysics is also often utilized in science, especially in its more theoretical branches. Paul sees this as a way to vindicate more traditional metaphysics observing that in metaphysics, “just as in science, theories are compared with respect to the elegance, simplicity and explanatory virtues of their models, and theories are chosen over their competitors using inference to the best explanation” (2012, 12). This methodological continuity between metaphysics and science faces naturalized metaphysics with another apparent dilemma: Either they tolerate these methods – including inference to the best explanation driven by theoretical virtues – or they criticize these methods with the risk that this criticism also compromises science and thus the foundation of naturalized metaphysics. Ladyman and Ross, however, reject this dilemma appealing once more to the success of science as making the important difference. Referring to the traditional methods of metaphysics and the results of these as ‘metaphysical assumptions,’ Ladyman and Ross reply to the dilemma in brief when writing: “the metaphysical assumptions in question are vindicated by the success of science, by contrast with the metaphysical assumptions on which autonomous metaphysics is based which are not vindicated by the success of metaphysics since it can claim no such success” (Ladyman and Ross 2007, 7). Ladyman and Ross are, as such, not denying that some of the methods that they criticize in the context of metaphysics are used in science, but the success of science sanctions the use of these methods in science whereas metaphysics cannot provide such a sanctioning. Ladyman and Ross do not substantiate this point further, but presumably they also here implicitly rely on their wholesale argument for the epistemic credibility of science. The success vindicates science and perhaps with it, any use of otherwise illegitimate methods.

Also Chakravartty notes that “metaphysical inference is inescapable” in “scientific ontology” (2017, 45) but proposes a slightly different response following his analysis of the difference between naturalized metaphysics and autonomous metaphysics in terms of epistemic risk. Since the empirical input is typically greater in science than in metaphysics, such “metaphysical inferences” are more constrained in science than in metaphysics. Thus, depending on the distance from science, there are “magnitudes of metaphysical inference that are conducive to knowledge and those that are so large as to suggest a suspension of belief” (Chakravartty 2017, 168). This sustains some difference between naturalized and non-naturalized metaphysics, but it reiterates a version of the problem considered above how this difference in epistemic risk compares to the risk involved in making these inferences in the first place. Are they ever conducive of knowledge even if they are sufficiently scientifically informed?

Perhaps realizing these issues, Ladyman (2012) has later argued that for instance explanatory power might not be as important in science as suggested by Paul’s

continuity argument and that the role of explanation in science and metaphysics is not similar enough to vindicate metaphysics (see also Huemer (2009) and Saatsi (2017)). Thus, the strategy here seems to be that the traditional methods of metaphysics are not after all employed in science, at least not in the form where they are problematic. The purpose here is not to give any assessment of this criticism and the response to it. Rather, the point is to emphasize that all responses to this alleged role of the traditional methods of metaphysics in science rely on the embedding of these methods in science (whether or not it is recognized that these methods actually play a role). It is, of course, in the spirit of naturalized metaphysics to appeal to science as a special context, but it is in this case also necessary since any general lenience toward these methods risks vindicating autonomous metaphysics as Paul's discussion exemplifies. This, however, importantly entails that for instance the theoretical virtues considered by Paul cannot be used outside of science. This includes, as discussed in chapter 6, the use of them to break the underdetermination of metaphysics by science.

In summary, two interrelated worries are raised here about how science is meant to secure the epistemic legitimacy of naturalized metaphysics. First, as just discussed, the epistemic legitimacy of science and naturalized metaphysics alike risks being compromised if science itself uses the problematic traditional methods of metaphysics. Second and as discussed earlier in this section, for science secure the epistemic legitimacy of naturalized metaphysics, an argument is apparently needed that establishes the epistemic credibility of science (and in such a way that it can support metaphysics). The worry, then, is that such an argument will have to appeal to the traditional methods of metaphysics. In that case, naturalized metaphysics either cannot secure its epistemic foundation if the methods of metaphysics are illegitimate or, if not, then naturalized metaphysics will be on par with autonomous metaphysics. Both worries are particularizations of arguments raised against scientism more generally, the view that only beliefs based on science can be rationally held.³¹ A general version of the first worry is for instance discussed by Rick Peels under the name "the *Fundamental Argument* against scientism" qualifying that "[t]he argument is that the fundament of natural science itself consists of the deliverances of nonscientific sources of belief" (2017a, 166), i.e. that non-scientific sources of belief are inevitable for scientific inquiry. Elsewhere, Peels also raises a general

³¹ Hietanen et al. (2020, sec. 2) distinguish between this strong variant of scientism and then a weaker variant that merely proclaim that science is the best source of knowledge and justification while still allowing for other sources. The latter view is arguably closer to that of moderately naturalized metaphysics (e.g. Morganti and Tahko 2017). This weaker variant should not be conflated with the view attributed to Ney and others above that science is the only, but possibly still in the end defective, place to begin metaphysics (and in this sense merely "best").

version of the second worry under the title “Should We accept Scientism? The Argument from Self-Referential Incoherence” (2020). The worry is that belief in scientism cannot be based on science and scientism is therefore argued to be incoherent (see also De Ridder 2014; Stenmark 2001).

Peels does recognize that the success of science could provide part of an answer to this second worry – a point also made by Hietanen et al. (2020, 536) in their defense of scientism against these two worries – but, as he notes, the success of science can at most provide justification for the view that beliefs based on science can be rationally held but, importantly, not that science is the *only* such basis (Peels 2017b, 14–15). For naturalized metaphysics, however, this suffices since the negative part of their scientism – that the traditional methods of metaphysics are problematic – is based on evolutionary naturalism which is then in turn established by an argument from success. Though Ladyman and Ross describe their position as “frank scientism” (2007, 61), they might, in other words, avoid the full force of the second worry, that is, Peels’ argument from self-referential incoherence.

Relating to the fundamental argument against scientism, the worry that science itself uses nonscientific sources, Peels explicitly mentions the naturalized metaphysics of Ladyman and Ross as a version of scientism that avoids this worry. According to Peels, naturalized metaphysics exemplifies a weaker version of scientism that do not “discard all [...] nonscientific sources of belief” (2017a, 168) but only a certain subset of them.³² Naturalized metaphysics can therefore avoid Peels’ (2017a, 169–70) global *reductio ad absurdum* variant of the fundamental argument against scientism: Since weak scientism allows that certain non-scientific sources of belief can deliver knowledge, science can deliver knowledge even if it depends on nonscientific sources. Notice, however, that while this is sufficient to defeat Peels’ global *reductio* it does nothing to appease the local version of this worry that science relies on precisely those nonscientific sources – the traditional methods of metaphysics – that naturalized metaphysics regards as illegitimate. As noted above, Ladyman and Ross also appeal to the success of science in their reply to this worry. Peels does not consider this line of argument, but it is related to a reply to Peels due to Hietanen et al. (2020). They observe that Peels’ fundamental argument assumes that the epistemic credibility of the output of science cannot exceed that of its least credible input. Attributing this “garbage in, garbage out” (Hietanen et al. 2020, 532) view to Jeroen de Ridder, they object that science is “founded upon ampliative inferences” and that this allows the output of science to have higher epistemic

³² This is so since Peels for instance include our senses and memory among these nonscientific sources whose reliability naturalized metaphysics does not dispute, at least for purposes of reading the results from scientific instruments.

credibility than its input, in contrast with strictly deductive inferences. When Ladyman and Ross give the success of science (and the absence of such success in metaphysics) as a reason why the role of traditional methods of metaphysics in science is unproblematic, they may implicitly be regarding this as evidence that science includes such “a process of error correction,” as Hietanen et al. (2020, 532) put it. Indeed, Ladyman and Ross elsewhere seem to express this view that science is error correcting when they write: “individuals are blessed with no epistemological anchor points, neither uninterpreted sense-data nor reliable hunches about what ‘stands to reason’. The epistemic supremacy of science rests on repeated iteration of institutional error filters” (2007, 29). The success of science is then evidence that these error filters do in fact work, even for filtering errors due to a role for the traditional methods of metaphysics.

There is, as such, reasons to believe that naturalized metaphysics can overcome these worries raised about scientism, both the global variants as discussed for instance by Peels and the local variants considered in the beginning of this section. While this is merely a promissory note, given that more details are arguably required for naturalized metaphysics to answer these worries satisfactorily, the remaining chapters will simply assume that naturalized metaphysics can overcome these epistemic worries. Naturalized metaphysics will, in other words, be regarded as able to obtain an epistemic credibility, not shared by autonomous metaphysics, through its connection to science, if only for the purpose of argument.

4 THE DEFLATIONARY CHALLENGE TO METAPHYSICS

Section 3.1 argued that naturalized metaphysics endorses metaphysical realism, and it is, thus, committed to the semantic view that metaphysical claims are meaningful and substantive claims about metaphysical facts. Naturalized metaphysics does not share the metaphysical deflationism that above was associated with Quine and Thomasson, despite some superficial similarities between their accounts of the problems with (traditional) metaphysics. However, the discussions about the credentials of naturalized metaphysics, especially in section 3.5, focused solely on epistemology and only alluded to the proposal within naturalized metaphysics that also its semantic credentials are inherited from science. This proposal is substantiated in most detail by Alyssa Ney in the paper “Neo-positivist metaphysics” (2012). Ney’s proposal is in fact rather ambitious since it proclaims that naturalized metaphysics can meet, or at least overcome, those deflationary challenges that the logical positivists and Carnap more particularly raised against metaphysics. These concerns were, at least also partly, shared by Quine, and Ney’s proposal may therefore suggest a way for naturalized metaphysics to answer the challenge implicitly raised in the preceding chapters whether naturalized metaphysics is Quinean enough. Ney, we might say, argues that there are no reasons for naturalized metaphysics to be more Quinean, and more particularly for it to be more deflationary, because naturalized metaphysics can at the same time be metaphysically inflationary and be “a version of metaphysics may survive the genuine worries the positivists had about metaphysics” (Ney 2012, 76).

Ney’s proposal is more precisely to try and develop a metaphysics that does not involve taking the outside perspective on the system as a whole that both Carnap and Quine are so critical of; Carnap specifies this perspective in terms of questions external to a linguistic framework and Quine, as detailed above, regards it as inquiring how the system of the world measures up to the thing-in-itself. Rather, Ney’s proposal is to limit our metaphysical commitments to those entities, structures, principles that are common to the rivalling frameworks of science. As such, we only commit to those elements where an internal question about their reality can be answered in the affirmative within each framework. With this approach, we never leave our place within science. This might at least soothe Quine who, in contrast to Carnap as mentioned in section 2.3, gives preference to the scientific framework. Ney in fact develops this proposal with Quine’s (1948) own indispensability argument as a template. But this reconciliation between Quine and naturalized metaphysics with its metaphysical realism is only superficial. The real issue, as this chapter indicates, is not whether there are procedures that will produce metaphysical commitments that are shared between all of science and which, in that sense, are therefore internal to

science. Rather, the issue is what to make of these commitments. In accordance with the general attitude within naturalized metaphysics, Ney interprets these commitments in a metaphysical realist manner whereby they comprise what really exists.

For Quine, or at least for the deflationary Quine portrayed above following Gibson (1992), Haack (1993), Hylton (1994; 2014), and Alspector-Kelly (2001), this is the potentially problematic step. This is so since the qualification that these elements really exist is prone, once more, to take the illegitimate outside perspective. Indeed, such an outside perspective seems necessary to specify the significance of such metaphysical commitments under metaphysical realism. Quine is arguably happy *to say* from within the scientific system of the world that these elements are real. The significance of saying this, however, is precisely that these are the elements that are indispensable within the scientific system. Whether this proves them to be *really* real looks like an inquiry into how the system as a whole relates to reality in itself, and this is precisely the external perspective that Quine finds problematic due to his rejection of first philosophy. Asking whether something is really real could be meaningful within the system, for instance if it was inquired whether an emergent particle-like phenomenon such as phonons are as real as electrons which are (currently) believed to be a fundamental constituent of the world. However, what Quine finds to be meaningless, as also quoted above and later in this chapter, is “the question whether or how far our science measures up to the *Ding an sich* (1981, 21–22, emphasis in original). More particularly, the problem is with questions that inquire about the relation between science and reality in general. This is also why Quine does not give any wholesale argument for his scientific realism, in contrast to Ladyman and Ross, but rather insists that no further questions can be meaningfully asked about the commitment that the indispensable elements of science are real.

The parallel between Quine’s reasoning and that attributed to Carnap below is clear, something that further signifies the similarities between the views of Quine and Carnap on this matter. It also corroborates the claim made below that Ney’s version of naturalized metaphysics is acceptable to neither Quine nor Carnap, though most of the chapter focuses on Carnap. This is not because they worry about the epistemic justification of naturalized metaphysics but because even this restrictive naturalized metaphysics carries semantic commitments that they reject as meaningless. Thus, when Ney describes her aim as “getting out a metaphysics that has established its semantic and justificatory credentials via physical theory itself” (2012, 64), Carnap and Quine will question the success of the former. This, of course, is of little consequence for those who do not share the metaphysical deflationist views of Carnap and Quine. They can instead find

promise in Ney’s proposal that a sufficiently restrictive naturalized metaphysics can inherit its semantic and epistemic credentials directly from physics, though chapter 6 will discuss whether this restrictive approach preserves metaphysics by eliminating any role for the metaphysician. Presently, however, the focus will be on the claim that naturalized metaphysics can inherit its semantic credentials from physics in a way that ensures that naturalized metaphysics will be a form of metaphysics that is acceptable even to Carnap and, as mentioned, Quine.

The remainder of the chapter consists of an article originally published in *European Journal for Philosophy of Science* 10(16), pp. 1-19, with the title “Old Problems for Neo-Positivist Naturalized Metaphysics” (2020a). The article is published under [CC BY 4.0](#) and reproduced here in its published form but without the formatting of the published version. The pagination of the published version is indicated using in-line brackets with the following formatting, [p. ##], where ## stands for the page number. Some references are formatted differently since some of the works cited have been assigned an issue in the meantime and therefore no longer is only “online-first”. The footnotes and sections (including references to these) are also numbered differently from the original, so they continue the numbering of the thesis.

Old Problems for Neo-positivist Naturalized metaphysics

4.1 INTRODUCTION

Naturalized metaphysics is a prominent recent player in the field of analytic metaphysics. It features both a destructive and constructive component: The destructive [p. 2] component echoes and renews the criticism of metaphysics found in the empiricist tradition while the constructive component offers a solution by a closer integration between science and metaphysics. It is the success of this latter constructive aspect of naturalized metaphysics that the present paper explores and ultimately refutes.

In her article “Neo-positivist Metaphysics”, Ney (2012) offers one of the most detailed accounts of a naturalistic approach that is claimed to yield a substantial metaphysics while avoiding the problems faced by traditional metaphysics. In accordance with the overall tenet of naturalized metaphysics, the characterizing feature of neo-positivist metaphysicians “is their serious engagement with the findings of science, particularly fundamental physics” (Ney 2012, 54). This kind

of naturalism – the deference to the findings of science – is supposed to ensure the success of the proposed naturalistic metaphysical method. As such, neo-positivist metaphysics is an example of the type of naturalized metaphysics that has followed in the wake of James Ladyman and Don Ross’ seminal work *Every Thing Must Go: Metaphysics Naturalized* (2007). This work shares Ney’s confidence that sensitivity to and engagement with the findings of science³³ legitimize substantial, non-deflationary metaphysical conclusions: “neo-positivist metaphysics [...] is the only legitimate place to begin if one is trying to accomplish at least one of the main tasks metaphysicians set for themselves – to establish conclusions about ultimate reality” (Ney 2012, 76).³⁴ Thus, where other recent attempts to salvage metaphysics adopt more modest ambitions on behalf of the content of metaphysics to preserve its practice (e.g. Thomasson 2015; Jenkins 2014; Hofweber 2016b), naturalized metaphysics, in contrast, preserves the subject matter by altering the practice: “metaphysics should not be abolished but reformed” (Ladyman 2017, 143). Even though naturalized metaphysics preserves the ambition of metaphysics to be a substantial study of ultimate reality, much traditional metaphysics must be left behind³⁵: Ney observes that neo-positivist metaphysics – her version of naturalized metaphysics – “is one that aims to be sensitive to a distinction between those metaphysical claims that can be justified and those that cannot, a distinction that finds its inspiration in the work of Carnap and the logical positivists” (Ney 2012, 54). The specific challenge to metaphysics considered by Ney is Carnap’s (1950) metaphysical deflationism that challenges the objectivity or framework-independence of metaphysics. While this challenge to metaphysics, according to Ney, remains a defeating problem for traditional metaphysics, the promise of neo-positivist metaphysics is to be a substantial metaphysics that evades the challenge: as a legitimate yet ambitious metaphysics, neo-positivist metaphysics shows “how a version of metaphysics may survive the genuine worries the positivists had about metaphysics” (Ney 2012, 76).

The present paper argues that neo-positivist metaphysics – and with it any other naturalized metaphysics – cannot live up to this promise. In so far as both traditional and neo-positivist metaphysics are attempts at a substantial

³³ This deference to the findings of science is also endorsed for instance by Ladyman and Ross (2007, 27), Chakravartty (2013, 30; 33), Kincaid (2013, 1; 5), Morganti (2013, 29–55), and Maudlin (2007b, 1).

³⁴ This ambitious conception of the aims of metaphysics is for instance displayed by Ladyman and Ross (2007, 9; 14), Chakravartty (2013, 31), Kincaid (2013, 5), and Morganti (2013, 20–21).

³⁵ For the critique of traditional, non-naturalized metaphysics see for instance Ladyman and Ross (2007, chap. 1), Chakravartty (2013, 32), Kincaid (2013, 1; 20–21), and Morganti (2013, 20–21).

metaphysics, they are equally vulnerable to the worries Carnap had about metaphysics. Since Ney – and with her other proponents of naturalized metaphysics – regards Carnap’s challenge to [p. 3] metaphysics as a defeating problem for traditional metaphysics, the aim of this paper is not to defend this challenge to metaphysics; though it will be indicated why it is not easily dismissed. Rather, the paper’s primary purpose is to advance the view that neo-positivist metaphysics and naturalized metaphysics in general cannot answer to Carnap’s challenge; despite the claims to the contrary. Even the strictest deference to the findings of our best sciences cannot exempt a metaphysics from Carnap’s challenge and legitimize it as a substantial, non-deflationary metaphysics; the resources to refute Carnap’s challenge must be found elsewhere. Thus, even though the subsequent discussion has its focus on Ney’s neo-positivist metaphysics, the conclusions go beyond this particular approach and extend to much of naturalized metaphysics.

In section 4.2, Carnap’s challenge to the framework-independence of metaphysics is introduced. Section 4.3 accounts how neo-positivist metaphysics responds to the challenge by singling out (the linguistic state of) physics as the proper starting point for metaphysics. However, as observed in section 4.4, the semantic nature of Carnap’s challenge prohibits any stipulation that certain frameworks are metaphysically privileged. The neo-positivists’ attempt to avoid this by appeal to the semantic credentials of physics (section 4.5) is argued in section 4.6 to be futile: science does not have the resources to address Carnap’s challenge either. Section 4.7 therefore concludes that the threat to substantial metaphysics due to Carnap’s challenge remains for neo-positivist metaphysics. With respect to Carnap’s challenge, neo-positivist metaphysics and naturalized metaphysics in general fare no better than traditional metaphysics. It is concluded that neo-positivist metaphysics cannot live up to its promise to “survive the genuine worries the positivists had about metaphysics” (Ney 2012, 76).

4.2 CARNAP’S CHALLENGE

Carnap develops his deflationist challenge to metaphysics in the article “Empiricism, Semantics, and Ontology” (Carnap 1950). The challenge builds on the observation that any question or claim must be made within what Carnap calls a linguistic framework. A linguistic framework can most simply be conceived of as a language fragment that includes certain terms and the syntactic and semantic rules for these terms (Eklund 2013, 234) which establishes the rules of the use and assessment for expressions in which the terms of the framework occur (Thomasson 2015; Flocke 2018). To introduce new terms (or linguistic forms as Carnap calls them) into a language one must adopt a linguistic

framework including these terms, thereby giving their linguistic rules. Carnap's claim is therefore that any question or claim must be made internally to a linguistic framework that introduces the terms occurring in the question or claim.

This poses a problem to debates in metaphysics if metaphysicians, as Carnap suspects, regard their claims as evaluated in an objective and absolute sense and not with respect to this or that linguistic framework. Carnap gives the example of a debate over the existence of numbers between a nominalist and a Platonist realist. The nominalist will insist that one cannot adopt a linguistic framework which includes names that refer to numbers, since she believes that numbers do not exist. The Platonist, on the other hand, finds such linguistic frameworks perfectly acceptable, since she believes that numbers do exist. According to Carnap, the metaphysicians' debate over the existence of numbers is different from zoologists asking: "Are unicorns [p. 4] and centaurs real or merely imaginary?" (Carnap 1950, 22). This latter question is asked within an implicit linguistic framework shared by the zoologists with common linguistic rules that specify the use of 'real' and 'merely imaginary' and thus provides the semantics required to assess answers to the question. In contrast, the metaphysical question concerning the existence of numbers seems to be asked prior or external to any linguistic framework. According to the nominalist and Platonist, it is a question that must be settled before one adopts a linguistic framework that includes reference to numbers.

The metaphysicians' question about the existence of numbers is an example of what Carnap calls a theoretical, external question: a question asked outside any linguistic framework (external), but which nevertheless is supposed to have an answer that is true or false (theoretical). But in Carnap's view, these two components are irreconcilable: without a linguistic framework no rules are in place with which to assess the utterance, i.e. to know what constitutes an answer to the question (Flocke 2018). Theoretical, external questions and claims are simply impossible.

I feel compelled to regard the external question as a pseudo-question, until both parties to the controversy offer a common interpretation of the question as a cognitive question; this would involve an indication of possible evidence regarded as relevant by both sides (Carnap 1950, 37).

Carnap challenges the nominalist and Platonist to specify what linguistic framework their existence question is internal to which should include indications how to assess possible answers to the question. If they fail to do this, their debate must be regarded as cognitively meaningless until they meet this

challenge (Carnap 1950, 25). By cognitive content or meaning Carnap understands the “meaning component which is relevant for the determination of truth” (Carnap 1956, 237).

Of course, if metaphysicians are ready to comply and provide an interpretation of their question within a specified linguistic framework, then metaphysics is just as legitimate as all other discourse. The nominalist and Platonist might for instance adopt what Carnap calls “the system of numbers” (1950, 24) which introduces to the language expressions such as ‘five is a number’. About the statement ‘there are numbers’, Carnap observes: “This statement follows from the analytic statement ‘five is a number’ and is therefore itself analytic” (1950, 24).³⁶ Numbers exist since there is a number such that it is the number five. Carnap anticipates that Platonists as well as nominalists will be dissatisfied with this answer. While they will acknowledge that it is true to say ‘there are numbers’ within the system of numbers, their concern is whether there *really* are numbers. But according to Carnap’s challenge, if this question is asked outside any linguistic framework, then it is cognitively meaningless. It can either be asked within a linguistic framework that includes linguistic rules for the qualifier ‘really’ or it can be a pragmatic question concerning the utility of adopting the system of numbers. It is Carnap’s general thesis that theoretical questions and claims – questions with definite answers and claims that are true or false – can only be made [p. 5] internally to a framework and that this introduces an inevitable framework-dependence in their evaluation. This is a threat to substantial, objective metaphysics specifically because it is the sort of study that is compelled to evaluate its claims from an objective and absolute perspective and not with respect to this or that linguistic framework.³⁷

The same concern applies even if the discussion is recast at the level of linguistic frameworks as a whole: whether for instance the Platonist framework with number terms or the nominalist framework without number terms is the framework that captures the way the world is. Again, we must specify the linguistic framework within which the question is posed or the question is

³⁶ Importantly, analyticity is for Carnap only defined with respect to a linguistic framework (Flocke 2018, 9). Thus, when he argues that ‘there are numbers’ is analytic this is with respect to the system of numbers and the same sentence might be a contradiction in a nominalist framework.

³⁷ Explicated like this, the challenge is semantic in nature; metaphysical questions and claims are cognitively meaningless, because they are meant to be theoretical questions asked and claims made prior to or outside any linguistic framework. There are less semantically and more epistemologically inclined interpretations of Carnap (e.g. J. M. Wilson 2014; Bradley 2017). However, this minority view will be set aside here. Those sympathetic to it can recast all of the following in terms of a semantic challenge to metaphysics inspired by Carnap with the same conclusion: naturalized metaphysics has no resources with which to answer this challenge.

cognitively meaningless, if it is meant in an absolute sense outside any linguistic framework. This signifies how Carnap endorses a principle of tolerance for linguistic frameworks (Carnap 1950, 40; see also [1934] 1937, 49): We are free to adopt whatever framework we want to! In particular, there is no question to ask about which linguistic framework is the true one from a framework free perspective. A metaphysician might stipulate that the terms of a particular linguistic framework are “joint-carving terms” (Sider 2011, vii), but this claim ‘the terms of this linguistic framework are joint-carving’ must by the same argument be made within a linguistic framework if it is meant as a theoretical claim; one that can be true or false. If it is meant to be asked prior to or outside any linguistic framework – in an absolute and framework-independence sense – then also this claim about the linguistic framework as a whole is cognitively meaningless.

Thus, Carnap’s challenge is simply this: A claim can only be made – and a question posed – if a linguistic framework is specified that introduces the linguistic rules for the terms occurring in the question and claim: “Existence-claims are not singled out for special treatment by Carnap; he asks only that they meet a standard to which all meaningful talk is subject, an appropriate sort of discipline or rule-governedness” (Yablo 1998, 233). Carnap’s challenge is a challenge to metaphysics, because its existence questions and claims do not share the “rule-governedness” of the zoologists’ question whether unicorns exist and the physicists’ claim that Higgs particles exist. In both cases, a linguistic framework is given (implicitly) with linguistic rules for the relevant terms – including rules for ‘exist’ – such that it is specified how to evaluate both question and claim. Metaphysicians are the ones who ask the further question whether the Higgs particle exists – not with respect to the linguistic framework adopted by the physics community – but whether it really exists in an absolute and framework-independent sense. It is this type of question that is problematic according to Carnap’s challenge, and it is thus a challenge to metaphysics and not to physics and zoology, because it is metaphysicians who attempt at these theoretical, external questions; they are the ones who are not content with internal questions and answers (Yablo 1998, 258–60; Sidelle 2016, 60). This is the genuine worry that Carnap had about metaphysics.

Several authors have voiced their worries about metaphysics based on Carnap’s challenge. Chalmers (2009) and Yablo (1998; 2009), among others, defend outright [p. 6] anti-realism or eliminativism for metaphysics and even more radically, Price (2009; 2013) proposes, on the grounds of Carnap’s arguments, a global expressivism. Others argue that metaphysics remains possible, e.g. Hirsch (2002; 2009), Kraut (2016), and Thomasson (2015), but echoes Carnap’s view that metaphysics must be internal to a linguistic framework. Theirs is what Chalmers (2009) denotes a “lightweight realism” as opposed to the

“heavyweight realism” of traditional metaphysicians such as the nominalist and Platonist above. Ney shares the Carnapian worries about metaphysics but defends an exemption for properly naturalized metaphysics. While expressivism is appropriate for other metaphysics, the integration of science in naturalized metaphysics permits it to be assertive; it can “establish conclusions about ultimate reality” (Ney 2012, 76). Of course, this might merely amount to a lightweight realism, where ‘ultimate reality’ is introduced with appropriate linguistic rules such that the stipulation ‘metaphysics aims to establish conclusions about ultimate reality’ is internal to a linguistic framework and thereby acceptable from the perspective of Carnap’s challenge. This, however, would involve a rather deflated notion of ultimate reality, and when Ney offers neo-positivist metaphysics as an answer to the speculation that “perhaps it is possible to reach some objective, non-arbitrary truths in metaphysics” (Ney 2012, 60), she does seem to endorse the traditional inflated notion of metaphysics. This also sits better with the ambition of naturalized metaphysics to preserve the aims of traditional metaphysics, and we shall therefore proceed on the assumption that neo-positivist metaphysics shares the aim to be an objective and framework-independent metaphysics. Consequently, both naturalized metaphysics in general and Ney’s neo-positivist variant are at the outset subject to Carnap’s challenge and the following will explore how Ney attempts to find resources within science to avoid Carnap’s challenge even while insisting that other metaphysics – not properly naturalized – remains problematic. However, I shall ultimately argue that this attempt fails: neo-positivist metaphysics – and with it all other naturalized metaphysics – is just as vulnerable to Carnap’s challenge as traditional metaphysics.

4.3 THE NEO-POSITIVIST RESPONSE TO CARNAP’S CHALLENGE

Ney gives the following exposition of the problem facing metaphysics in the light of Carnap’s challenge:

As metaphysicians, don’t we seek objective truth? But how can we achieve this goal if there will always be rival frameworks offering competing accounts of the truth and no objective way to choose between them? If we agree with Carnap, we must deny we possess any way to verify which ontology is correct (Ney 2012, 59).

Each linguistic framework entails a particular ontology. So, if any linguistic framework may be adopted, this introduces an inherent framework-dependence for ontology. This, as Ney emphasizes, threatens the metaphysicians’ search for objective truth. ‘There are numbers’ is true in the Platonist framework and false in the nominalist framework. So long as any framework can be adopted, the

ontological commitment to numbers can only be the expression of preference for a linguistic framework in which the internal [p. 7] claim ‘there are numbers’ is true. Thus, Ney recognizes that any approach to metaphysics must counter this challenge in order to establish objective conclusions about ultimate reality; to be a substantial and not merely framework-dependent metaphysics.

The problem for neo-positivist metaphysics is therefore to find a way for the metaphysician to seek objective truth. The first step in the neo-positivist method is to defend that there is a linguistic framework – or collection of frameworks – that is proper to adopt for a metaphysician. Being a naturalist, Ney proposes “to select whatever linguistic state fundamental physics is in when we find it and take that to determine our ontology” (Ney 2012, 59), because “[t]his strategy of getting out of the positivist dilemma wouldn’t necessarily have the choice of ontology be subjective or arbitrary because those physical theories that physicalists use to inform their metaphysics have already met high standards for justification and acceptance” (Ney 2012, 59). The linguistic state of fundamental physics can serve as the framework-independent truth sought by metaphysicians because physics has already met these standards. Apparently, the external question regarding the choice of framework can be given a theoretical answer (in Carnap’s sense)³⁸: choose the linguistic state of physics.

As Ney observes, there might be “rival formulations of physics” that “support different interpretations” (2012, 60) such that these comprise different linguistic frameworks that are all included in the linguistic state of fundamental physics.³⁹ So even if it is rational to adopt the linguistic state of fundamental physics, the problem of competing frameworks remains, and with it a threat to the metaphysicians’ search for objective truth. To accommodate this, Ney proposes to adopt metaphysical commitment only to those “representational features that are as a matter of fact indispensable to our best physical theories as they are actually understood” (Ney 2012, 60). Elsewhere, it is qualified that such “representational features” can include entities, structures, and principles. Indispensability is to be determined by the physics community; it is not the task of philosophers. An element is indispensable simply if it occurs in all the rival formulations of a physical theory endorsed by the physics community. The adoption of the metaphysical commitments to one of these rival formulations would merely be an expression of the preference for that particular linguistic

³⁸ Again, a theoretical answer in Carnap’s sense is an answer that is true or false, i.e. something beyond an expression of preference which is implied by a pragmatic answer in Carnap’s sense.

³⁹ Exactly what is to be regarded as two rival formulations of the same theory as opposed to two rival theories is not entirely clear. Following the rest of the neo-positivist method this question should perhaps be settled by the physics community. Regardless, this issue will not affect the general prospects of neo-positivist metaphysics, but only the particular metaphysical conclusions that may be inferred.

framework, but those elements that are truly indispensable, Ney speculates, can be regarded as having “genuine significance and justification, something that [goes] beyond merely expressing one’s preferences for a particular kind of conceptual scheme or linguistic framework” (Ney 2012, 60–61).

The metaphysical commitments that follow from this indispensability argument are called ‘core metaphysics’. Ney (2012, 63) gives Lorentz invariance and the Born rule as examples of such indispensable elements. Lorentz invariance is part of core metaphysics, since all physicists agree that any relativistic theory must be Lorentz invariant. Likewise, the Born rule is included as a representational element in all the rival formulations of quantum mechanics. This is contrary to for instance determinism, since there are both deterministic [p. 8] and indeterministic formulations of quantum mechanics. Therefore, neither determinism nor indeterminism can be included in core metaphysics.

The neo-positivist method thereby addresses Carnap’s challenge in two steps:

Using this method, all ontological claims will be given sense and justification using the standards of our best science. Nor are the ontological results achieved trivial or arbitrary, since we have not merely selected one system and read our results off. We have only followed what is common to all systems (Ney 2012, 62).

As the first step, the neo-positivist metaphysician insists that there are good reasons to adopt the linguistic frameworks endorsed by the physics community. The metaphysics implied by these inherits its sense and justification directly from science. The thesis is that the linguistic frameworks of physics are the only genuine competing accounts of the (fundamental) truth.⁴⁰ If the physics community unanimously endorsed the same linguistic framework – if there were no rival formulations of physical theories – then our metaphysics should consist of the representational elements of that framework. However, since there are rival formulations of physical theories, we must limit our metaphysical commitments to the indispensable elements of our physical theories, i.e. to those elements that occur in all the rival formulations endorsed by the physics community. The upshot is that these elements – core metaphysics – are then known to be elements of ultimate reality according to neo-positivist metaphysics. Ney regards it to be “appropriate for the neo-positivist metaphysician, when moving beyond the core, to endorse an expressivism about her claims and say they aren’t intended to assert something that is true or false” (Ney 2012, 67). The significance of Carnap’s challenge is such that expressivism

⁴⁰ Perhaps the linguistic state of other sciences may be relevant for the determination of non-fundamental truth.

is appropriate for any metaphysical claim not included in core metaphysics. The metaphysical commitment to Lorentz invariance has “genuine significance and justification” and therefore qualify for assertion, whereas a metaphysical commitment to determinism and (most of) the claims of traditional metaphysics are merely expressions of preference for particular linguistic frameworks. Only core metaphysics avoids the framework-dependence due to Carnap’s challenge that renders all other metaphysics merely expressive.

4.4 CARNAP’S SEMANTIC CHALLENGE

Ney directly compares the expressivism for non-core metaphysics to the global expressivism defended by Huw Price, but argues that physics justifies that core metaphysics may be assertive rather than expressive (Ney 2012, 67). The comparison is interesting since Price (2009; 2013) also finds inspiration for his expressivism in Carnap’s challenge. He finds it instructive to think of Carnap’s distinction between internal and external claims in terms of the use/mention-distinction. Price writes:

Legitimate *uses* of the terms such as 'number' and 'material object' are necessarily internal, for it is conformity (more or less) to the rules of the framework in [p. 9] question that constitute use [...]. The only legitimate external questions simply *mention* the term in question (Price 2009, 324, emphasis in original).

The problem with external questions and claims is a semantic problem. There is simply no way to use terms prior to or outside a linguistic framework. Theoretical, external questions and claims are problematic exactly because they use terms outside the frameworks that introduce the linguistic rules necessary for their use. Theoretical, internal questions and claims use terms, but within a specified framework, and pragmatic, external questions and claims only mention the disputed terms and are therefore legitimate. In contrast, any attempt at a theoretical, external question or claim is a misuse of language. The problem with pseudo-questions and -claims is not that they are questions that cannot (yet) be answered and claims whose truth value cannot (yet) be settled. Carnap’s challenge is a semantic and not an epistemological challenge.

Returning to Carnap’s example of the nominalist’s and Platonist’s debate over the existence of numbers, Carnap challenges them to specify the common linguistic framework in which the debate takes place to ensure that their respective existence claims are meaningful. The challenge thus precedes the epistemological worries that one cannot *know* whether numbers exist or *know* which of the nominalist and Platonist linguistic framework that accords

with reality. Similarly, the problem with different formulations of physics is not simply that they entail different answers to metaphysical questions with no way to know which is correct. Rather, the challenge is to specify the linguistic framework that renders these questions and answers meaningful in first place; it must be specified how and in what sense the different linguistic frameworks associated with the rival formulations are “competing accounts of the truth” before one can even ask which is the true account. The semantic problem must be resolved before any epistemological issues can even be comprehended.

Emphasizing this semantic character of Carnap’s challenge exposes the ambition of neo-positivist metaphysics: Traditional metaphysics has a semantic defect that renders it merely expressive, but according to Ney, the close integration of core metaphysics with physics somehow removes this defect. Initially, neo-positivist metaphysics may seem promising even taking into account this semantic dimension of Carnap’s challenge as Ney insists that “[f]orming one’s metaphysics in this way does not involve answering any Carnapian external questions” (Ney 2012, 62). An element is included in core metaphysics only if it is true to say that it exists within each of the linguistic frameworks associated with each of the rival formulations of physics. Core metaphysics is constructed by asking internal existence questions and then selecting those that are answered in the positive by all the linguistic frameworks endorsed by the physics community.

That the procedure is limited to the linguistic frameworks endorsed by the physics community is, however, an important qualification. There are linguistic frameworks in which the claims of core metaphysics are not true. They are just not taken into consideration since the linguistic state of fundamental physics is stipulated as the proper starting point for metaphysics. But how should we conceive of the claim: ‘the linguistic state of fundamental physics is the proper starting point for metaphysics’? The first part ‘the linguistic state of fundamental physics’ refers to a collection of linguistic frameworks; those associated with the rival formulations of physics endorsed by the physics community. Metaphysics is the study of ultimate reality, so arguing that **[p. 10]** these frameworks are the proper starting point for metaphysics seems to entail that these frameworks stand in a privileged relation to ultimate reality not shared by other linguistic frameworks. Rather than singling out one linguistic framework as that which carves nature at its joints, Ney singles out a collection of frameworks as the possibly joint-carving ones. But this move must be regarded with suspicion from the perspective of Carnap’s challenge.

As already discussed, Carnap’s challenge cannot be avoided by moving from individual existence questions and claims to statements about the relation between reality and linguistic frameworks as a whole. Claiming that the Platonist

framework accords with reality is just as worrisome as the Platonist's claim that numbers really exist. In both cases, to be a theoretical claim, it must be specified within which framework the claim is made. Whether talking of numbers or linguistic frameworks as a whole, the linguistic rules for these terms as well as those for 'existence' and 'reality' must be introduced before their relation to reality can be asserted. The same goes for 'the linguistic state of fundamental physics' which denotes a collection of linguistic frameworks. The sentence, 'the linguistic state of fundamental physics accords with ultimate reality', might well be true *to say* within some linguistic framework that introduces the relevant linguistic rules. What is illegitimate from the perspective of Carnap's challenge is any stipulation that this claim is not only correct within some framework, but that it really is so independently of any framework. When Ney proposes the linguistic frameworks endorsed by the physics community as the answer to the question 'what framework (or collection of frameworks) accords with reality?', this is subject to the same worries that apply to the nominalist's and Platonist's discussion about the system of numbers: For the nominalist and Platonist, Carnap argues: "Unless and until they supply a clear cognitive interpretation, we are justified in our suspicion that their question is a pseudo question" (Carnap 1950, 25). Both are pseudo-questions, or it must be explicated within which linguistic frameworks they are made.

Emphasizing this semantic dimension of Carnap's challenge thus shifts the main interest from choosing between the competing frameworks of physics to the problem what it means to say that these frameworks are preferred in the first place. Selecting what are common features among the rival formulation of physics will not be relevant until it is settled in what sense these rival formulations are the "competing accounts of the truth" and what it means for their representational elements to "correspond to something in reality" (Ney 2012, 64).

Before we proceed with the neo-positivist's attempt to respond to this problem, notice how this problem is not peculiar to Ney's neo-positivist metaphysics. Rather, it applies to both naturalized metaphysics more generally and to all other attempts to avoid Carnap's challenge by singling out particular linguistic frameworks as the proper starting point for metaphysics. Anyone who takes Carnap's challenge seriously – that you cannot use terms without appropriate linguistic rules – must recognize that any stipulation about some framework being privileged is itself framework-dependent. This applies to Ney's proposal to take the linguistic state of physics as the starting point for metaphysics. But it also applies to other naturalized metaphysicians' proposal to take science in general as the starting point for metaphysics, or the proposal to begin at ordinary language as suggested, for instance, by Thomasson's (2015) easy approach to

ontology. Privileging frameworks is not a way to transcend the framework-dependence [p. 11] of metaphysics due to Carnap's challenge. Unless Carnap's challenge can be avoided, such metaphysics can only ever amount to a deflationary metaphysics, where the significance of metaphysical commitments is that these are the elements for which it is true to say that they exist within the specified framework (or set of framework as it is the case for neo-positivist metaphysics).

4.5 A RESPONSE TO THE SEMANTIC CHALLENGE

Ney does offer some indications of how neo-positivist metaphysics – as opposed to traditional metaphysics – is supposed to avoid the semantic dimension of Carnap's challenge when she argues that “all ontological claims will be given *sense* and justification using the standards of our best science” (Ney 2012, 62, my emphasis); when she declares that “the goal is to get out a metaphysics that has established its *semantic* and justificatory credentials via physical theory itself” (Ney 2012, 64, my emphasis); and when she concludes of core metaphysics that “[t]his is a metaphysics that should meet the positivist's standards for *comprehension* and justification” (Ney 2012, 61–62, my emphasis).

Neo-positivist metaphysics is claimed to be a metaphysics that is both semantically and epistemologically credible, even by the positivists' and thereby Carnap's standards, as opposed to metaphysics established with other (traditional) approaches. The semantic and epistemological credibility of core metaphysics is a result of the strict naturalism imposed by the neo-positivist method. No independent metaphysical reasoning is allowed. The task of the metaphysician is merely to consult the linguistic state of fundamental physics and establish core metaphysics from the indispensable elements. Following the method of neo-positivist metaphysics, the metaphysician can and should not study reality directly. Instead Ney quotes Carnap's suggestion to take science itself as the object of study (Ney 2012, 76; Carnap 1984, 6).⁴¹ Perhaps it would even be appropriate to qualify that the neo-positivist metaphysician should take the physics community as the object of study. The task of the metaphysician is simply to collect into a metaphysics those representational elements – entities, principles, and structures – that are regarded as indispensable by the physics community.

⁴¹ Ney here refers to Carnap's “On the Character of Philosophic Problems” (1984) which was originally published in 1934 under the same title (Carnap 1934); the same year as Carnap's *Logical Syntax of Language*. In both works Carnap proposes that philosophy should take science as its subject matter. Ney takes this to imply that science is the preferred evidence for metaphysics, whereas Carnap's intention is that philosophy should primarily be involved in developing languages for science (Carnap [1934] 1937, 277–84).

This strict naturalism of neo-positivist metaphysics then ensures that any question regarding the semantic or epistemic credibility of core metaphysics is deflected with the response that core metaphysics simply inherits its credentials from physics. A challenge to the semantic and epistemological credibility of core metaphysics becomes a challenge to the credibility of physics. This is the essential feature of the neo-positivist response to Carnap's challenge:

the relevant semantic and epistemological claims I mean to endorse here are only the following. First, the claims of our best, fundamental physical theories are [p. 12] meaningful. Second, the claims of our best, fundamental physical theories are justified (Ney 2012, 62).

Anyone who challenges the semantics of core metaphysics also challenges the meaningfulness of our best fundamental physical theories. Anyone who challenges the epistemological standing of core metaphysics also challenges the justification of these physical theories. This is why the linguistic state of physics can be a starting point for metaphysics and ultimately the neo-positivist response to Carnap's challenge: Fundamental physics is meaningful and justified, and by its strict naturalism, so is neo-positivist metaphysics.

Any question regarding how the neo-positivists' core metaphysics can be a substantial, framework-independent metaphysics – and thus overcome Carnap's challenge – is deflected with reference to the semantic and epistemic credibility of physics. Concerning the semantics of physics, Ney insists that the only relevant semantic claim to endorse is that physics is meaningful and continues: "The point is that physics has a proven track record of success making it a good place to begin metaphysical inquiry" (Ney 2012, 62). This, I take it, is ultimately the neo-positivists' response to a sufficiently insisting Carnapian interrogator. It is the track record of physics that legitimizes a metaphysics derived from physics. Any question regarding the semantics – and for that matter the justification – of such metaphysics is dismissed with reference to this track record of success in physics. There is no need for such questioning, as the foundation of neo-positivist metaphysics, namely physics, has already proven itself. Generally, this is what the proponents of naturalized metaphysics find so promising about physics (e.g. Hawley 2006; Bryant 2020a, sec. 2.3). Physics and science in general are the only fields of inquiry which can display such a track record of success, one that is particularly impressive in comparison with traditional metaphysics, which, as Ladyman and Ross argue, "can claim no such success" (Ladyman and Ross 2007, 7).⁴²

⁴² See Stoljar (2017) for a recent discussion and refutation of this received view that there has been little progress in philosophy.

While on Ney's view the Platonists' and nominalists' commitment to the existence and non-existence, respectively, of numbers is merely an expression of preference of a particular linguistic framework and *cannot* be a statement about ultimate reality due to Carnap's challenge, the success of science warrants a commitment to the indispensable elements of its competing linguistic frameworks (as judged by the physics community) as really existing in an absolute and framework-independent sense. The success of science somehow guarantees that a commitment to its indispensable entities, structures, and principles can be meaningfully asserted as a theoretical, external claim; this in a way that is acceptable to positivists' and Carnap's standards, despite Carnap's repeated insistence that theoretical, external questions and claims are without cognitive content. In summary, the neo-positivist metaphysicians seek to avoid Carnap's challenge by deflecting any question regarding the semantics of core metaphysics by reference to the semantic credentials it inherits from the linguistic state of the physics community. They then in turn refuse to answer any question regarding the semantics of the physics community with reference to the success of physics, which apparently is supposed to make such questions obsolete. [p. 13]

4.6 OLD PROBLEMS FOR NEO-POSITIVIST METAPHYSICS

The success of science, however, is arguably neither metaphysical nor direct referential success. Rather, this success is a success in prediction and explanation. Thus, a further argument is needed to show why it is meaningful to say in a theoretical, external sense 'reality is really such that Lorentz invariance holds' whereas it is merely an expression of preference for a particular linguistic framework to say 'there are really numbers'. There seems to be two ways to understand the neo-positivists' and other naturalists' response that physics has proven itself by its success such that any further questioning of its semantics is obsolete. Either this may be understood as implying an argument that defends the semantic credentials of physics based on its track record of success, or the response should be taken at face value as the naturalists' final remark on the matter. A Carnapian will probably regard the latter as simply giving in to the challenge, i.e. as the confession that neo-positivist metaphysics simply accounts what is true to say within the linguistic frameworks adopted by the physics community about the reality of its entities, structures, and principles. The adopted linguistic rules for the term 'reality' and the role of Lorentz invariance within the linguistic frameworks associated with the rival formulations of physics are adequately relevant for their predictive success so the claim 'reality is such that Lorentz invariance holds' is true within these frameworks. However, any further stipulation such as 'reality is really such that Lorentz invariance holds' should be treated no differently from the nominalists' and Platonists' debate

over whether numbers really exist: either we introduce linguistic rules for the qualifier 'really' or this is meant as a theoretical, external claim and is therefore without cognitive content according to Carnap's challenge. Giving in to Carnap's challenge in this way, the looming framework-dependence and entailed lack of objectivity is just as significant for neo-positivist metaphysics as for traditional metaphysics.

The alternative is that the mention of the success of physics signifies an implicit argument that may establish other semantic credentials for physics, and thereby for neo-positivist metaphysics, than those held by traditional metaphysics. Ney does not provide any details as to how the track record of physics may reinstate framework-independence for neo-positivist metaphysics in such a way that the claims of core metaphysics may be regarded as true about ultimate reality. Refusing to explicate an argument cannot be a viable strategy in defending it, but without such details, it will be speculation how the track record of physics ensures that physics and therefore core metaphysics can avoid Carnap's challenge.

The immediate candidate for such an argument is some variant of the well-known no-miracles argument for realism: "The positive argument for realism is that it is the only philosophy that doesn't make the success of science a miracle" (Putnam 1979, 73). Just as ordinary empirical evidence is taken to support first order scientific theories, so is the general success of science taken as evidence for (semantic) scientific realism – that the posits of successful scientific theories are real – as a second order theory about the referential success of the first order theories of science. Thus, if the no-miracles argument – or some other argument – can establish scientific realism as a framework-independent thesis, then this might vindicate neo-positivist metaphysics. But according to Carnap's challenge, also scientific realism and the no-miracles argument must be stated within a linguistic framework which introduces the relevant terms and their linguistic rules; most importantly the terms 'reality' and 'real'. Assuming a linguistic [p. 14] framework where we say of something that it is real if it plays the right explanatory role for the predictive success of a scientific theory (the realist framework), then 'the predictive success of science implies that its posits are real' is true to say within that linguistic framework. However, in a framework where we say of something that it is real if it is observable (the anti-realist framework), then 'the predictive success of science implies that its posits are real' is false to say within that linguistic framework. Within the realist framework, scientific realism is true, and the no-miracles argument holds, but this is not the case within the anti-realist framework.

Following this Carnapian spirit,⁴³ Psillos (2011) argues that “scientific realism is *not* a theory; it’s a framework which makes possible certain ways of viewing the world” (311, emphasis in original).⁴⁴ Since scientific realism is framework-dependent, a commitment to scientific realism can merely signify the decision to adopt a particular ontic framework: the linguistic framework that introduces into the language the relevant terms and associated linguistic rules needed to make existence claims. More precisely, a commitment to scientific realism is nothing but the implicit expression of preference for the realist framework which introduces linguistic rules for terms such as ‘real’ and ‘exist’ to the effect that for instance ‘electrons exist’ is true to say within that framework. Since other ontic frameworks are available, a commitment to scientific realism can be no different from the Platonist’s and nominalist’s commitment to the existence and non-existence of numbers when identified as the expression of preference for the nominalist and Platonist linguistic frameworks, respectively. Following Carnap’s challenge, it is a pragmatic choice whether to adopt a Platonist or nominalist framework, and the same applies to the question whether to adopt a realist or anti-realist framework: “the decision to adopt the realist framework is an unforced decision” (Psillos 2011, 310). Even the no-miracles argument is no help here. As observed above, the argument is not framework-independent. Psillos concludes: “the no-miracles argument works within the *realist* framework; it’s not an argument *for* it. It presupposes rather than establishes the realist frame” (Psillos 2011, 312, emphasis in original).

One might object that the no-miracles argument was never meant to establish the realist framework; an objection that relates to the worry that Psillos misconstrues scientific realism, when he identifies it with the realist framework.⁴⁵ Though the adoption of the realist framework reproduces an ontology that resembles the realist ontology, it is upon further scrutiny instrumentalism in elaborate disguise (Jakslund 2017). The significance of the ontological commitments – the significance of positing ‘electrons exist’ – within the realist framework is simply that these are elements that play a particular role in the predictive success of our theories, i.e. instrumentalism. The realist framework introduces linguistic rules for ‘real’ and ‘exist’ to mimic realist talk, whereas scientific realism is a theory about what exists. The problem, however, due to **[p. 15]** Carnap’s challenge and as identified by Psillos, is that scientific

⁴³ Psillos more precisely finds the inspiration for this view in Feigl’s empirical realism (1950) which Carnap in a footnote describes as advancing “a closely related point of view on these questions” (Carnap 1950, 32).

⁴⁴ A more careful Carnapian might instead say that scientific realism is a framework which makes possible certain ways of talking about the world to avoid any impression that this framework holds a special relation to (aspects of) the world.

⁴⁵ Thank you to an anonymous reviewer of this journal for pressing me on this point.

realism as a thesis is only meaningful within a linguistic framework, and only true within the realist framework. Similarly, while the no-miracles argument can establish scientific realism as a theory, it can only do so *within* the realist framework and the argument is thus framework-dependent, as already observed above. Psillos is not proposing an alternative form of scientific realism, but rather develops the only form of scientific realism that is viable given Carnap's challenge: one that is inevitably tied to the realist framework and thus framework-dependent.

In summary, Carnap's challenge is semantic in nature, and this semantic challenge is just as relevant for theoretical, external claims about the entities or whole frameworks of science, as it is to metaphysics as exemplified by the nominalist and Platonist. Any claim about the correspondence between reality and the linguistic frameworks endorsed by the physics community – any claim about their semantic credentials – is a pseudo-claim unless it is made within a linguistic framework. This entails that Carnap's challenge cannot be avoided by adequately relating metaphysics to science: Adopting the framework of the scientific community, so that scientific and metaphysical questions and claims are internal to a framework, has the consequence of reintroducing the framework-dependence. There are no theoretical (in Carnap's sense) grounds on which to adopt a framework or class of frameworks; not even those endorsed by the physics community despite physics' track record of success.

4.7 CONCLUSION

A footnote with a remark about Carnap and Quine summarizes Ney's view and exposes the problem of neo-positivist metaphysics:

Note that this does involve in one sense at least siding with Carnap against Quine. Quine, recall, argued that we don't even have objective, not-merely-pragmatic standards of verification within science. So, Quine was a pragmatist about all matters, not just metaphysical matters. The present view depends on rejecting such a global pragmatism. Science can provide us with objective justification for its claims (Ney 2012, 62 fn 9).

Ney rejects global pragmatism and adopts the view that science is objective. According to Ney, science makes claims that are not framework-dependent, and beginning with the frameworks of science, we can therefore derive a metaphysics with genuine significance and justification. However, in doing so, Ney sides with neither Quine nor Carnap: "the acceptance of a framework must not be regarded as implying a metaphysical doctrine concerning the reality of the entities in question" (Carnap 1950, 32). Following Carnap's challenge, a claim

can only be made – and a question posed – if a linguistic framework is specified that introduces the linguistic rules for the terms occurring in the question and claim. Every evaluation of the truth of a claim must be made within a linguistic framework that introduces rules governing such an evaluation; how else to proceed with the evaluation? But this is what institutes an [p. 16] unavoidable framework-dependence such that the evaluation can never be objective and non-pragmatic. According to both Quine and Carnap, one must for semantic reasons adopt this sort of global pragmatism.⁴⁶ It makes no difference that Ney at places such as the above seems to express it as an assumption – or perhaps rather a hope – that science provides objective grounds for metaphysics. As argued in section 4.6, neither the no-miracles argument nor any other argument based on the success of science can secure realist science – and by association, naturalized metaphysics – an exemption from Carnap’s challenge; science generally has no resources with which to construct an argument against it. An assumed local exemption for neo-positivist metaphysics would be just as ungrounded as a nominalist’s insistence that the nominalist framework escapes Carnap’s challenge while the rest of metaphysics remains subject to it. The neo-positivist metaphysician can of course reject Carnap’s challenge entirely, but such a rejection would have to be global, and therefore entail that all metaphysics goes free of the challenge; including the traditional metaphysics that naturalized metaphysicians so vigorously criticize. Nothing entitles an exception specifically for core metaphysics. The promise that neo-positivist metaphysics is a way to avoid Carnap’s challenge is therefore unfulfilled. No deference to science can save metaphysics from this threat to framework-independence and objectivity.

In *Theories and Things*, Quine nicely illustrates the spirit of Carnap’s challenge when it comes to science and science-based ontology. He writes: “The scientific system, ontology and all, is a conceptual bridge of our own making, linking sensory stimulation to sensory stimulation” (Quine 1981, 20). This, however, does not result in relativism. To quote Quine at length:

But it is a confusion to suppose that we can stand aloof and recognize all the alternative ontologies as true in their several ways, all the envisaged worlds as real. It is a confusion of truth with evidential support. Truth is immanent, and there is no higher. We must speak from within a theory, albeit any of various [...]. What evaporates is the transcendental question of the reality of the external world – the question whether or how

⁴⁶ Indeed, as argued by several authors (e.g. Alspecter-Kelly 2001; Price 2009; Soames 2009), Carnap and Quine more or less agreed about the nature and prospects of metaphysics and their disagreement primarily concerned the analytic/synthetic distinction.

far our science measures up to the *Ding an sich* (Quine 1981, 21–22, emphasis in original).

While the framework internal questions about the existence of unicorns and Higgs bosons remain, the whole question “whether or how far our science measures up to the *Ding an sich*” – whether unicorns or Higgs bosons *really* exist – is a pseudo-question if it is meant to be asked outside any linguistic framework. This follows directly from Carnap’s challenge.⁴⁷ The question of realism “evaporates”, as Quine puts it. There are framework-independent claims neither in metaphysics nor in science and therefore no semantic credentials to inherit from science that grant neo-positivist metaphysics an exemption from Carnap’s challenge.

This deflation of realist science and metaphysics alike renders the Carnapian immune to the neo-positivists’ insistence that physics simply *is* semantically credible [p. 17] and the general attitude of naturalized metaphysics that “[t]he onus is on the sceptic about metaphysics to point out some relevant semantic or epistemic difference between the theoretical content and the metaphysical content of theories” (Ladyman 2007, 185). With the insistence that framework-independent discourse and not metaphysics as such is the problem, the Carnapian can simply consent that, on the part of semantics, there is no difference between science and metaphysics: both are framework-dependent. Metaphysics becomes problematic only when it attempts to change the mode of speech and particularly the mode of evaluation so that it is not conducted within linguistic frameworks, but the same applies to science when it shares in this ambition. Carnap’s challenge is a challenge to metaphysics simply because it is most often metaphysics that attempts to transcend linguistic frameworks, but this goes for naturalized metaphysics as well when it attempts to make this move on its own, on behalf of science, or argues that the move is already made in science by the scientific community. The semantic parity with science is no help here, since Carnap’s challenge is just as significant for scientists as it is for metaphysicians. It is equally significant for any inquiry that attempts to move beyond the discourse internal to frameworks. Questions about objective, ultimate reality are pseudo-questions, whether they are asked within metaphysics or science, if they are meant as theoretical, external questions.

Ultimately, this is why naturalized metaphysics cannot be a solution to Carnap’s challenge. Likewise, Carnap’s challenge is the reason why naturalized metaphysics is not a successful answer to how metaphysics is possible. In the light of Carnap’s challenge, naturalized and non-naturalized metaphysics are equally problematic. When the proponents of naturalized metaphysics, like Ney,

⁴⁷ Creath (1990) argues that Quine indeed made this thesis based on Carnap’s views.

are suspicious towards traditional analytic metaphysics for Carnapian reasons, they should be just as suspicious towards their own naturalized metaphysics and even towards realist science. If Ney's neo-positivist metaphysics aims to be an objective, substantial metaphysics, it is just as vulnerable to Carnap's challenge as every other type of metaphysics. Even the very strict naturalism imposed by Ney cannot save neo-positivist metaphysics from this challenge. The neo-positivist metaphysician is no better off than the nominalist and Platonist who discuss the existence of numbers(, abstract entities, or mereological sums) without any regard for scientific findings.

To conclude: Neither naturalized nor traditional metaphysics is possible until or unless Carnap's challenge is refuted or resolved and naturalized metaphysics holds no resources with which to achieve this. As a naturalized metaphysics, neo-positivist metaphysics can therefore not live up to its promise to "survive the genuine worries the positivists had about metaphysics" (Ney 2012, 76).

5 ON CONFLICTS BETWEEN METAPHYSICS AND SCIENCE

As discussed in chapter 3, naturalized metaphysics is not anti-metaphysical in the sense that it seeks to end all metaphysical inquiry. Rather, naturalized metaphysics “is an exercise in metaphysics,” as Ladyman and Ross (2007, 26) put it. Naturalized metaphysics is in the business of answering metaphysical questions but in doing so it must always remain deferential to science. This chapter explores where this leaves metaphysicians who question aspects of science and the account of the world they purport to give. Famous encounters like this include the metaphysical worries raised about action at a distance in Newton’s theory of gravity (see, e.g., Henry 2019), the debate between Einstein and Bergson over the nature of time in light of relativity theory (see, e.g., Canales 2015), and arguably also Einstein’s objections to quantum mechanics based on a metaphysical preference for local realism which was the occasion for his debates with Bohr (see, e.g., Bohr 1949). More recently, metaphysicians have raised their concerns about the apparent absence of space at the fundamental level of description in certain theories of quantum gravity, and this example will serve as a case study below.

Given that naturalized metaphysics requires that metaphysics must be motivated by science and that opposing science seems to be the exact opposite, it looks like naturalized metaphysics can reach a quick verdict on such conflicts. Indeed, as also quoted and discussed in more detail below, Ladyman and Ross write of science and scientists that “only a foolhardy philosopher should be willing to quarrel with them on the basis of his or her hunches (Ladyman and Ross 2007, 18). This chapter, however, argues that naturalized metaphysics should not be equally dismissive of all conflicts between metaphysics and science. Rather, it finds that some conflicts should be welcomed as reminders of where it is necessary to do more naturalized metaphysics. The legitimate conflicts are those that are driven, not (primarily) by a metaphysical bias, but by a metaphysical question that science does not answer explicitly. The conflict between metaphysics and science will, in such cases, arise because science only answers the metaphysical question in the negative, illustrated, for instance, when some theories of quantum gravity reject that distance can be the world-making relation (more on this below). In such cases, this chapter argues, it is beneficial for naturalized metaphysics if the metaphysicians put up some resistance until one finds an alternative world-making relation to distance, i.e., until an alternative positive answer to the metaphysical question is developed based on science.

Insisting on an answer to a metaphysics question is, however, not entirely innocent from the perspective of naturalized metaphysics. While naturalized

metaphysics in general regards metaphysical questions as meaningful, not all metaphysical questions are well-posed and answering them is therefore prone to lead to domestication. This was illustrated in section 3.4 with an Aristotelian's question about which motions are natural and which are forced according to our current best science. Even if this question is asked of, and thus seeks an answer motivated by, our current best science, naturalized metaphysics should not try to answer it. For conflicts between metaphysics and science to be legitimate by the standards of naturalized metaphysics, metaphysicians should therefore prepare themselves to discover that the question driving the conflict is ill-posed and in any case be careful to avoid domestication when trying to answer it. This is part of being deferential to science as naturalized metaphysics requires. However, the only way of finding out whether a metaphysical question is ill-posed is by the careful investigation of our current best science. From the perspective of naturalized metaphysics, discovering like this that a metaphysical question involves misguided categories or pre-conceptions should be regarded as contributing to naturalized metaphysics. Thus, the chapter concludes, conflicts between metaphysics and science that are driven by the absence of a positive answer to a metaphysical question will prove helpful to naturalized metaphysics irrespective of whether the question is answered or discovered to be ill-posed.

Scientific theories – being developed with another purpose in mind – will often not answer our metaphysical questions explicitly. Whether a metaphysical question is ill-posed or just difficult to answer will therefore often be complicated to decide. Through the example of the world-making relation in non-spatial theories in quantum gravity, this chapter exemplifies this point and more generally, illustrates how metaphysical questions might be answered in naturalized metaphysics as a negotiation between the inevitable metaphysical pre-conception built into the questions and the scientific theory of which they are raised. This importantly shows how metaphysical questions are to some extent malleable such that versions of a question may be answerable by the standards of naturalized metaphysics while other versions are not. Doing naturalized metaphysics is as such not as straightforward as one might expect. Even with a solid knowledge of the details of a scientific theory, working out what metaphysical questions it is epistemically safe to answer and what their answers are is a precarious task since it must continuously keep an eye out for domestication. This further signifies why the identification and analysis of the risk of domestication is one of the most important contributions made by Ladyman and Ross.

Following the spirit of this worry, Ross, in the end, warns about the kind of approach suggested here where elements of traditional metaphysics are

preserved for purposes in naturalized metaphysics which he, following French (2014), denotes “the Viking approach” (Ross 2016, 217). Ross (2016, 222) contrasts this with “the Norman approach” that seeks to do with science alone. Ross gives the latter

as an example of doing metaphysics without recourse to any concepts or distinctions recovered by Vikings from raids on traditional metaphysicians. If one can do metaphysics this way, then the naturalist’s preferred approach is to restrict herself, as a methodological principle, to doing it only in this way. Otherwise the booty brought home by raiders is likely to include Trojan horses that will ultimately invite a recrudescence of analytic metaphysics, with perhaps only the advantage that self-subsistent individuals have been purged from it (Ross 2016, 226).

Arguably, asking the questions of traditional metaphysics is exactly risking the inclusion of such “Trojan horses.” The chapter does implicitly discuss this risk through its considerations of domestication, but Ross makes the point that naturalized metaphysics can avoid this risk altogether only if it avoids the concepts or distinctions – and thus the questions – of traditional metaphysics. Ross proposes, therefore, to do so if at all possible. With the epistemic focus of naturalized metaphysics outlined in chapter 3, this attitude is sensible: It maximizes the epistemic credibility of naturalized metaphysics. However, naturalized metaphysics is also meant to be “an exercise in metaphysics,” as Ladyman and Ross himself put it. Intuitively, the more restrictive naturalized metaphysics is, the less metaphysics it can do. Thus, the question is how to strike the right balance. As this chapter outlines, the more liberal approach discussed below is consistent with the core commitments of naturalized metaphysics, but this is not the same as saying that a more restrictive approach cannot be more advisable, as Ross suggests. Indeed, chapter 6 will give further reasons based on the underdetermination of metaphysics by science for considering adopting the more restrictive approach to naturalized metaphysics. These discussions, however, will be postponed until then.

The remainder of the chapter consists of an article originally published in 2021 in *European Journal for Philosophy of Science* 11(74), pp. 1-24, with the title “An apology for conflicts between metaphysics and science in naturalized metaphysics” (2021c). The article is published under [CC BY 4.0](https://creativecommons.org/licenses/by/4.0/) and reproduced here in its published form but without the formatting of the published version. The pagination of the published version is indicated using in-line brackets with the following formatting, [p. ##], where ## stands for the page number. Some references are formatted differently since some of the works cited have been

assigned an issue in the meantime and therefore no longer is only “online-first”. The footnotes and sections (including references to these) are also numbered differently from the original, so they continue the numbering of the thesis.

An apology for conflicts between metaphysics and science in naturalized metaphysics

5.1 INTRODUCTION

[p. 2] While there is no univocal definition of metaphysics, it is often characterized as the “systematic study of the most fundamental structure of reality” (Lowe 1998, 2), as “the study of ultimate reality” (van Inwagen 2015, 1), or as “*the exploration of the most general features of the world*” (Blackburn 2002, 61, emphasis in original).⁴⁸ This characterization, however, might just as well be given of fundamental physics, at least adopting a realist voice. Fundamental physics is arguably also interested in the structure and features of ultimate reality. It is therefore not surprising that this (apparent) overlap in subject matter between metaphysics and fundamental physics is a seed of conflict. This paper investigates such conflicts and more generally conflicts between metaphysics and science. The paper argues that, rather than being dismissed as signs of metaphysicians’ overconfidence, conflicts between metaphysics and science should be welcomed as hints of genuine and important questions to be answered by naturalized metaphysics. While metaphysics should ultimately defer to science, as naturalized metaphysics argues, metaphysicians should only yield once science – through naturalized metaphysics – provides a positive (metaphysical) answer to their metaphysical questions.

As a case study, the paper uses theories of quantum gravity – theories that attempt to reconcile quantum mechanics and general relativity – where space appears to be absent at the fundamental level of reality as described by those theories. Space, distance, and generally extension do not seem to feature in the

⁴⁸ Such characterizations of metaphysics are disputed by others (e.g. Bennett 2016; Paul 2012) who argue that the questions addressed by metaphysics are different from those of science in general and physics in particular. This debate will be set aside here, though, since the focus will be on instances where metaphysics – as least as the term is used here – does come into direct conflict with science as exemplified by the conflict between Lewisian metaphysics and quantum gravity. Perhaps this shows that ‘metaphysics’ is misused in the present account, but anyone favoring this view can replace ‘metaphysics’ in the following by a more adequate term that they find better captures the sort of questions for instance Lewis asks about world-making.

fundamental ontology implied by quantum gravity theories such as loop quantum gravity and causal set theory (Huggett and Wüthrich 2013). Consequently, such theories are received with suspicion by some metaphysicians and philosophers of science who have questioned the coherence of non-spatial ontologies (e.g. Esfeld 2019; Hagar and Hemmo 2013; Lam and Esfeld 2013; Maudlin 2007a). Presently, the focus will be metaphysical concerns about the non-spatial theories of quantum gravity that variously echo David Lewis' (1986a; 1986b; 1994) thesis that spatial distance is the fundamental relation in the world and in particular, the relation in virtue of which the elements of an ontology make up a world.⁴⁹ The disappearance of space in some theories of quantum gravity thus gives rise to a conflict between these scientific theories and Lewisian metaphysics (Wüthrich 2019): Where the Lewisians⁵⁰ argue that spatial [p. 3] distance – given its role as the world-making relation – is a necessary fundamental element in any coherent metaphysics, these theories of quantum gravity propose that in the actual world space is non-fundamental.

Naturalized metaphysics is known to vigorously criticize metaphysics that is not sufficiently informed by the discoveries of our best sciences. It is therefore not surprising that naturalized metaphysics finds it misguided when metaphysics quarrels with science: “If there is a contradiction between the physics and the metaphysics, then the metaphysics must give way” (Bird 2007, 7).⁵¹ This sentiment is even shared by metaphysicians who are not usually cast as naturalists. Jonathan Lowe, for instance, gives metaphysicians the advice of “opening oneself up to the possibility that one's claims about the metaphysical features of actuality will be undermined by developments in empirical scientific theory” (Lowe 1998, 26). Even outside of naturalized metaphysics, few are inclined to follow Parmenides who, on a priori grounds, famously argued against the existence of change despite the empirical evidence to the contrary. The

⁴⁹ For a more detailed account of Lewis' “worldmate relation”, see Darby (2009).

⁵⁰ We shall use ‘Lewisians’ as a collective term for those who express a preference for the fundamentality of spatial distance. While the proponents of this thesis do not in general endorse all aspects of Lewis' metaphysics, we shall use this term since especially Lewis' Humean supervenience thesis is routinely referred to in support of the ontological prioritizing of spatial distance (e.g. Esfeld and Deckert 2017; Lam 2016).

⁵¹ Obviously, this ruling relies on an appropriate demarcation between physics (and science in general) and wild speculation that may happen to involve some mathematical formalism; some might worry that some theories of quantum gravity are examples of the latter (see for instance Hedrich (2007) for a discussion of this and similar questions in relation to string theory). This issue will be set aside here for the reason also discussed further in footnote 17 that the present apology for conflicts between metaphysics and science does not rely on the assumption that the scientific theories in question are speculative or yet to receive proper empirical confirmation.

received view, in other words, seems to be that science takes priority over metaphysical theorizing in cases of direct conflict.

This promises to quickly resolve the conflict between Lewisians and the non-spatial theories of quantum gravity: Considering that their resistance – like Parmenides’ – appears to be at least partly based on a priori reasoning, the Lewisians should simply yield and give up the fundamentality of spatial distance.⁵² For naturalized metaphysics, this conflict is another illustration that science-independent metaphysics is not only futile but also harmful, if it aims to compete with science (e.g. Bryant 2020a).⁵³ This paper, however, proposes that naturalized metaphysics might benefit from preserving such conflicts, at least for a while. As Humphreys (2013) observes, “[c]ontemporary science has revealed a much more subtle and interesting world than the often simple worlds of speculative ontologists” (p. 75). Science is sometimes in conflict with metaphysics as a whole in the sense that it proves that none of our hitherto conceived metaphysical frameworks are viable. However, what new metaphysics that science replaces these with will only be revealed if we remember to probe the metaphysics of a scientific theory and not simply end our inquiry – as naturalized metaphysics sometimes seems to recommend – when science proves our held metaphysical beliefs wrong. The presence of conflicts between metaphysics and [p. 4] science, I argue, is often the most vivid manner in which the metaphysical surprises of science manifest themselves, and these conflicts are therefore our best sign of when and where to begin such inquiry. This does not entail a rejection of the verdict that science generally takes priority over metaphysics. However, the paper proposes the qualification that it might be helpful if metaphysics offers a bit of (adequately motivated) Parmenidean resistance. The conflicts that result will encourage engagement with the metaphysical issue behind the conflict and thus ensure that science – through a naturalized metaphysics – not only proves our old metaphysics wrong but also provides a new *metaphysics* in its stead. The Parmenidean resistance of metaphysicians might, in other words, prove an invaluable resource for naturalized metaphysics. Furthermore, the paper argues that in merely raising unanswered metaphysical questions, this type of Parmenidean resistance should be acceptable to naturalized metaphysics even assuming all its central tenets.

⁵² Such a priori motivated resistance against empirical science will be denoted ‘Parmenidean resistance’ due to the methodological analogy with Parmenides’ a priori arguments against the apparent experience of change. This despite the curious coincidence that loop quantum gravity – especially with the apparent disappearance of time (e.g. Anderson 2012; Isham 1993) – has similarities in content with Parmenides’ metaphysics.

⁵³ See Ladyman and Ross (2007, 19–20) for a general criticism of Lewis’ metaphysics from the perspective of naturalized metaphysics.

To illustrate how conflicts between metaphysics and science can serve as generators for naturalized metaphysics, the paper explores the conflict between non-spatial theories of quantum gravity and Lewis-inspired metaphysics. Lewisians argue that without space in their fundamental ontology, such theories lack a candidate world-making relation and they are, as a consequence, at risk of being metaphysically incoherent. Following the present proposal, this is an occasion to inquire into the metaphysical question behind the conflict: what, if anything, might replace space as the world-making relation in non-spatial theories of quantum gravity?⁵⁴ Rather than ending with this methodological suggestion, the paper exemplifies it by reviewing the details of loop quantum gravity based on which it is argued that entanglement might serve as the world-making relation in this non-spatial theory. In a few more words, entanglement between the nodes in the spin-network of loop quantum gravity is found to be crucial for the emergence of space in this theory. This is taken to indicate that entanglement might be the relation in virtue of which the elements of the spin-network make up a world and thereby be the relation that glues together the fundamentally non-spatial worlds of loop quantum gravity; a proposal that should arguably qualify as a “subtle and interesting” alternative to the ontologies of distance, but which is nevertheless motivated by science as naturalized metaphysics requires. This account thereby concretely exemplifies how the methodological proposal of the paper can be implemented to contribute to naturalized metaphysics.

The paper proceeds as follows: Section 5.2 introduces the case study: the conflict between Lewisians and non-spatial theories of quantum gravity. Section 5.3 then discusses how philosophers who pursue such conflicts are typically derided in naturalized metaphysics but argues that they should not be if the conflict is driven by the absence of a viable metaphysical interpretation of the scientific theory. In such cases, conflicts can serve as a heuristic tool for naturalized metaphysics. Section 5.4 exemplifies how this plays out in the proposal that entanglement is the world-making relation in loop quantum gravity, thereby answering the question that motivated **[p. 5]** the Lewisians’ conflict with the non-spatial theories of quantum gravity. Finally, a conclusion follows.

⁵⁴ When asking this question with respects to quantum gravity, we might be seen as following Norton’s (2020) suggestion that “metaphysicians ought to utilize quantum theories of gravity [...] as incubators for a future metaphysics” (p. 1).

5.2 A CONFLICT BETWEEN METAPHYSICS AND SCIENCE

The Humean supervenience thesis⁵⁵ “says that in a world like ours, the fundamental relations are exactly the spatiotemporal relations” (Lewis 1994, 474).⁵⁶ A fundamental relation is important for Lewis’ modal realism, since it explains why something belongs to one rather than to another of all the actually existing possible worlds. It explains, in other words, how two entities can be recognized as *worldmates*: “things are worldmates iff they are spatiotemporally related. A world is unified, then, by the spatiotemporal interrelation of its parts” (Lewis 1986a, 71). Thus, both the notion of world and the worldmate relation is, according to Lewis, grounded in spatiotemporal relations.

The aim here is not Lewis exegesis, and the outset for the discussion is instead more recent proposals, inspired by Lewis, that emphasize the centrality of *spatial* distance and which are explicitly directed against the non-spatial theories of quantum gravity. An example is the ontology of distanced matter points promoted by Esfeld and Deckert (2017). They argue that spatial distance is the relation that makes the world; the “world-making relation” in the terminology of Esfeld (2019). In their view, the need for a world-making relation can be maintained independently of modal realism. Irrespective of whether the other possible worlds exist, there is a plausible sense in which we – and the entities with which we surround ourselves – belong to the same world. We are worldmates, and as such, some relation must make this fact true: “given a plurality of objects, there has to be a certain type of relations in virtue of which these objects make up a world” (Esfeld and Deckert 2017, 3). The need for a world-making relation comes from the need of ontological glue, and this is required as soon as we commit to the existence of “a plurality of objects” in the actual world. The task of the world-making relation is to be the relation that connects the elements of the ontology into configurations and as such, it grounds whether we live in a multiverse of more detached parts or a single connected universe. Thus, ‘what makes it true that we are worldmates?’ suggests itself as a genuine metaphysical question independently of modal realism.⁵⁷

The quest for a theory of quantum gravity does not, however, begin with this question. Rather, quantum gravity research is driven by an aspiration for unification of our account of nature: “The problem of quantum gravity (QG) is to

⁵⁵ The Humean supervenience thesis has more to it than the claimed fundamentality of distance relations, see for instance Weatherson (2015) for an introduction.

⁵⁶ It is charitable to observe, as Darby (2009, 202) does, that Lewis regarded this thesis as fallible.

⁵⁷ See Jaksland (2021a) for further discussion of the need for a world-making relation in the absence of modal realism.

find a theory that describes the phenomena at the intersection of general relativity (GR) and quantum field theory (QFT)” (Crowther and Linnemann 2017, 2). This problem [p. 6] has generated several competing research programs, the most prominent being string theory, loop quantum gravity, causal set theory, and causal dynamical triangulation (see the contributions in Oriti (2009) for an overview of these programs with focus on space and time). In their attempt to reconcile general relativity and quantum mechanics, several of these appear to do away with space at the fundamental level description.⁵⁸ Loop quantum gravity, which we shall use throughout for illustration, offers a fundamental description of the world in terms of an abstract graph structure consisting of nodes and links.⁵⁹ Both the nodes and the links carry a spin representation (SU(2)) and together these define the kinematical Hilbert space of states. States of this Hilbert space are manifestly invariant under local gauge transformations of the spin representation, and this presentation of loop quantum gravity is therefore called a spin-network. Since spin-networks are discrete, they already differ from the smooth structure of space. Indeed, most spin-network states will not even admit an approximation as a smooth spacetime just like an equilibrium thermodynamic description is only available if the macroscopic behavior of a system is sufficiently robust with respect to the individual changes among the microscopic degrees of freedom. When space is said here to be non-fundamental in loop quantum gravity, this is meant to be analogous to the sense in which temperature is non-fundamental in statistical mechanics.⁶⁰

Even if space is absent at the fundamental level as described by non-spatial theories like loop quantum gravity, Esfeld (2019) insists that the question remains what makes it true that we are worldmates: “in this case, we need another world-making relation than the spatial or spatiotemporal one” (p. 4). The problem, as Esfeld (2020) formulates it elsewhere, is that “no one has hitherto worked out a proposal for another type of relations than distances that could [...] be empirically adequate” (p. 1892). One might object to Esfeld that if

⁵⁸ In so far as these theories aim to recover general relativity and general relativity describes the dynamics of spacetime, the theories are naively committed to recovering spacetime as an emergent phenomenon. Whether this is sufficient to regard spacetime as real is debated (e.g. Lam and Wüthrich 2018; Le Bihan 2018; 2019; Baron 2020). We shall set this debate aside here and simply observe that space appears to be absent at the *fundamental* level of the ontology which is sufficient to generate the conflict with Lewisian metaphysics.

⁵⁹ This is one of several possible expositions of loop quantum gravity, see Rovelli (2008) and references therein for an overview.

⁶⁰ Since equilibrium thermodynamics requires that “all reasonable macroscopic observables have steady values” (Pitowsky 2006, 432), no macroscopic description applies to many of the kinematically admissible microstates. The same applies to generic spin-network states: special circumstances must obtain for it to admit an approximation where anything is recognizable as space. See Wüthrich (2017) for further details and discussion of the disappearance of space in loop quantum gravity.

space is absent at the fundamental level of description, then the same could be the case for worldmates. Indeed, people, tables, and chairs play no explicit role in for instance the fundamental description in terms of spin networks in loop quantum gravity. This, however, does not show that there are no worldmates and no need for a world-making relation. If two elements are worldmates at some level of description, then irrespective of what (complex) they correspond to at the fundamental level of description, they must arguably remain worldmates and some relation must make this fact true. Thus, just as one inquires [p. 7] how a non-spatial theory of quantum gravity accounts for space, one can inquire what at its fundamental level of description makes it true that we are worldmates. As discussed in further detail in Section 5.4, we should remain open to the possibility that these theories prove ‘worldmate’ to be an inadequate category with the consequence that no question about world-making arises, but the reason would be more subtle than the absence at the fundamental level of the entities usually supposed to be worldmates. Rather, the question might be obsolete if it turns out that the categorization in terms of elements and relations is problematic. Presently, the need for a world-making relation will largely be taken for granted for purposes of illustration and it is therefore left open that the physics might in the end render this metaphysical question to be ill-posed rather than providing another world-making relation⁶¹; though we shall argue that loop quantum gravity does seem to suggest entanglement as alternative world-making relation.

Assuming the question about world-making is well-posed, if the distance relation is absent at the fundamental level of the ontology, then another relation must take its place, but according to Esfeld no such alternative is currently on offer.⁶² Consequently, Esfeld (2019) cautions against the apparent metaphysical import of these (seemingly) non-spatial theories of quantum gravity: “as things stand, it is reasonable to recommend caution about proposing far reaching ontological consequences such as the disappearance of spacetime or fundamental spatiotemporal relations” (p. 13). These worries about fundamentally non-spatial worlds are reasons to be skeptical of these scientific theories; especially of their alleged metaphysical implications. In other words, though Esfeld offers it in a conciliatory voice, metaphysical concerns are pivoted

⁶¹ Likewise, we shall not enter the debate whether some views on emergence, ontological reduction, and levels of reality might allow that entities at some level of description are worldmates while entities at another level of description – such as those of the supervenience base of the former – are not.

⁶² With space being emergent (in some sense) in the non-spatial theories of quantum gravity, one might propose that distance could *remain* the world-making relation. See however Wüthrich (2019, sec. 7) for a rejection of this argument.

against scientific theorizing – here in the form of specific theories of quantum gravity with metaphysically worrisome implications.

While Esfeld and the other authors mentioned in the introduction are those that voice their concern about the non-spatiality of certain theories of quantum gravity most explicitly, many of their worries are mirrored by those who prefer the Bohmian interpretation of quantum mechanics out of a concern for the absence of local beables⁶³ in other interpretations (e.g. Bricmont 2017; Maudlin 2007a); some of these even expressing an explicit sympathy for Humean supervenience (e.g. Loewer 1996; Miller 2014). Also the primitive ontology program (also most often pursued in the context of quantum mechanics) explicitly requires that “any satisfactory fundamental physical theory [...] contains a metaphysical hypothesis about what constitutes physical objects [...] which lives in three-dimensional space or space–time and constitutes the building blocks of everything else” (Allori 2015, 107). According to (this type of) primitive ontology, space is a precondition for any satisfactory metaphysics and thus an essential component of the metaphysics of a satisfactory [p. 8] physical theory. Consequently, proponents of primitive ontology and more generally those favoring local beables will most likely share Esfeld’s sentiment that theories without space at the fundamental level of their ontology should be treated with caution, or perhaps even deem such theories metaphysically illegitimate. This, then, generates a tension with non-spatial theories of quantum gravity and offers a concrete example of a conflict between metaphysics and science.

Before we proceed to the attitude towards such conflicts in naturalized metaphysics, one may wonder how this and other conflicts like it can be sustained for long enough to be the subject of a methodological discussion. Why are these conflicts not simply resolved instead? After all, the scientific theories in question are readily available in research papers, reviews, and even often textbooks. When Esfeld worries what is the world-making relation in non-spatial theories of quantum gravity, the question could just be met with a ‘like this’ – presenting the theories’ best account of the world. He can just have a look.⁶⁴

⁶³ In the sense of Bell (2001).

⁶⁴ As Esfeld (2019) notes, “the approaches to quantum gravity that allegedly entail that spacetime or spatiotemporal relations are not fundamental are approaches that, as things stand, do not yield any empirical predictions” (p. 11–12); they find themselves in a very speculative domain of high energy physics. This is a warranted note of caution about these theories, however, the apology made here for conflicts between metaphysics and science will not utilize this fact. Metaphysicians do not need this as an excuse when they ask metaphysical question of scientific theories.

Science, however, rarely explicitly answers the questions of interest to metaphysicians. As also often argued in relation to the underdetermination of metaphysics by science (see for instance Andersen and Becker Arenhart (2016), French (2011), and Jones (1991)), the metaphysics of a scientific theory is rarely manifest in its formalism. Thus, having the theory readily available will usually not immediately answer the metaphysical inquiries one might direct at it, and this is for good reason: the questions driving the scientific theories are different from those driving the metaphysical exploration of them.⁶⁵ Theories of quantum gravity and the metaphysical questions here directed at them make for a good example. As stated above, the construction of a theory of quantum gravity is driven by the problem of reconciling general relativity and quantum field theory; a problem that has proven difficult and that has therefore called for novel developments in theoretical physics. Non-spatial theories are among these developments, and their surprising character is a consequence of these difficulties. In other words, these theories were not developed to fulfill an aspiration to explore the possibility of a non-spatial physical theory. What these theories seek to make manifest is how they might recover general relativity and quantum field theory, and not what replaces distance as the world-making relation. Theories of quantum gravity are designed to answer a particular question of physics; not various metaphysical inquiries. This explains why a conflict between metaphysics and science can persevere: Science rarely, if ever, answers metaphysical [p. 9] questions explicitly and this, as shall be argued in the next section, is why conflicts between metaphysics and science can prove useful.

5.3 NATURALIZED METAPHYSICS AND METAPHYSICAL QUESTIONS

Naturalized metaphysics features both a destructive and constructive component: The destructive component criticizes the traditional methods of metaphysics – intuitions, common sense, conceptual analysis, and a priori reasoning – while the constructive component proposes that metaphysics should instead be based on the findings of our current best sciences: “Naturalism requires that, since scientific institutions are the instruments by which we investigate objective reality, their outputs should motivate all claims about this reality, including metaphysical ones” (Ladyman and Ross 2007, 30).

⁶⁵ Esfeld (2019) relies on this underdetermination to question whether space is in fact absent at the fundamental level of these seemingly non-spatial theories of quantum gravity alluding to the apparent non-locality in quantum mechanics which was nevertheless reinstated in Bohmian mechanics (and thus proved to be at least consistent with the quantum formalism). However, the present argument does not rely on such underdetermination as part of its apology for conflicts between metaphysics and science, and it will therefore be assumed for purposes of argument that spacetime does disappear in these theories of quantum gravity.

Proponents of naturalized metaphysics argue that our intuitions, concepts, and patterns of a priori reasoning are the results of biological evolution, and according to Ladyman and Ross (2007) “there is no reason to imagine that our habitual intuitions and inferential responses are well designed for science or for metaphysics” (p. 3). These evolved cognitive features furnish no faculty that can provide insights about reality, and it is therefore problematic when they have traditionally formed the methodological basis for metaphysics. This is especially so, when metaphysics take interest in those parts of reality that we do not encounter in our lifeworld, for instance the content and structure of fundamental reality. Here, any reliance on these evolved features is “ignoring the fact that science, especially physics, has shown us that the universe is very strange to our inherited conception of what it is like” (Ladyman and Ross 2007, 10); the sentiment also expressed by Humphreys (2013, 75) above. According to Ladyman and Ross, this criticism also applies when metaphysics moves from claims of the actual world and to modal claims of possibility and necessity. In arguing what is metaphysically possible or necessary, the traditional methods of metaphysics have proven unreliable.⁶⁶ Ladyman and Ross write:

we deny that a priori inquiry can reveal what is metaphysically possible. Philosophers have often regarded as impossible states of affairs that science has come to entertain. For example, metaphysicians confidently pronounced that non-Euclidean geometry is impossible as a model of physical space, that it is impossible that there not be deterministic causation, that non-absolute time is impossible, and so on (Ladyman and Ross 2007, 16; see also Maudlin 2007b, 187–88).

The traditional methods of metaphysics can neither be employed to say what is the case nor what can or cannot be the case. In particular, they cannot be employed to inform what features are indispensable for metaphysically coherent worlds. [p. 10]

By this destructive component of naturalized metaphysics, there are no resources within metaphysics that can be mobilized for a quarrel with science. Indeed, Ladyman and Ross forcefully reject this type of speculation:

Physicists do not believe there are such things as good a priori grounds for holding beliefs about the constitution of the

⁶⁶ Since the aim here is an apology for conflicts between metaphysics and science *within* naturalized metaphysics, this alleged unreliability of the traditional methods of metaphysics on questions about possibility will be taken for granted here even though it, as for instance Morganti (2016, 87) argues, is questionable whether science has been any more reliable in its judgements about possibility.

physical world, and we suggest that only a foolhardy philosopher should be willing to quarrel with them on the basis of his or her hunches (Ladyman and Ross 2007, 18).

This includes “hunches” about possibility, and it should therefore be equally “foolhardy” to quarrel like this whether the science in question is empirically well-confirmed or not (though the former may be more preposterous than the latter). Even if a scientific theory is not actualized, nothing internal to metaphysics can justify the claim that a scientific theory describes an impossible state of affairs. This is also in good accordance with the constructive component of naturalized metaphysics that requires metaphysics to be motivated by the outputs of science; being in conflict with a scientific hypothesis – well-confirmed or not – looks to be the exact opposite. But how, one might ask, can we decide whether this theory is a scientific theory – such that this is a conflict between metaphysics and science – and not a piece of metaphysics itself whereby the conflict would be internal to metaphysics? Naturalized metaphysics has two independent replies: First, it can be argued that it makes no difference whether the theory being questioned by metaphysics is scientific or not. In both circumstances, there is no epistemically legitimate basis for the conflict due to the problems with the traditional methods of metaphysics. Second, Ladyman and Ross (2007) identify science “using institutional factors as proxies rather than by directly epistemological criteria” (p. 37) such that “a ‘scientific hypothesis’ is understood as an hypothesis that is taken seriously by institutionally bona fide science” (p. 30). Institutional factors – including being published in respectable scientific journals and funded by scientific research funds (Ladyman and Ross 2007, 36) – rather than empirical confirmation demarcate science from non-science. According to Ladyman and Ross, metaphysics cannot question the institutionally identified scientific hypotheses that include those of quantum mechanics and the relativity theories, but also arguably the main contenting theories of quantum gravity such as loop quantum gravity, string theory, etc. From the perspective of naturalized metaphysics, proclaiming that worlds without space are impossible seems to be no different from the claim that non-Euclidean worlds are impossible, and one might therefore speculate whether the former, like the latter, is a mere example of metaphysicians’ overconfidence.

This view has recently been advanced by Lam and Wüthrich (2020). Assuming that science should inform (or “guide”) metaphysics, they argue that.

from the point of view of the QG [quantum gravity] approaches pointing to the disappearance of spacetime [...] assuming a priori an ontological framework for QG relying on some standard smooth spacetime background (e.g. assuming a priori

an ontology of local beables for QG) is neither physically nor metaphysically legitimate (contrary to what is sometimes claimed in the literature, see Esfeld [(2019)]. Indeed, in this perspective, such a metaphysical assumption is illegitimate [p. 11] since it directly conflicts with certain physical ingredient principles on which the considered QG approaches are based (Lam and Wüthrich 2020, 12).

Since Esfeld and others, on Lam and Wüthrich's construal, defend the need for space(time) at the fundamental level of the ontology on a priori grounds, it is *illegitimate* for them to hold onto this metaphysical assumption when the considered approaches to quantum gravity point to the non-fundamentality of space(time). The scientific theory takes priority over metaphysical reasoning in cases of conflict. Insisting on an a priori metaphysical assumption in the interpretation of the scientific theory, i.e. "[p]ostulating ontologies on some fixed background spacetime for these QG approaches", Lam and Wüthrich conclude, "stands in direct tension with the naturalism we have adopted and in particular with a naturalistic approach to metaphysics" (Lam and Wüthrich 2020, 13). In stressing their focus on specific "QG approaches" and in recognizing that these are still lacking in empirical support, Lam and Wüthrich are open to the possibility that the theory of quantum gravity that is eventually vindicated is one where space remains fundamental. However, they nevertheless insist, and thus echoes the view above, that this is no excuse for metaphysical objections to these non-spatial approaches. Lam and Wüthrich appeal to a naturalistic approach to metaphysics to argue that Esfeld and others must end their illegitimate metaphysically motivated criticism of the non-spatial theories of quantum gravity.⁶⁷

But exactly why is naturalized metaphysics critical of (a priori) metaphysical conflicts with science? The general aim of naturalized metaphysics is not, and should not be, to end metaphysics. Naturalized metaphysics involves a criticism of the methods but not the subject matter of traditional metaphysics. In contrast to eliminative programs advocating metaphysical anti-realism (e.g. Carnap 1950; Chalmers 2009; Yablo 1998), Ladyman (2017) insists that "metaphysics should

⁶⁷ Notice that this does not entail that the non-spatial theories of quantum gravity considered by Lam and Wüthrich take priority over other theories of quantum gravity that are more hospitable to fundamental spatial relations (e.g. Goldstein and Teufel 2001; Dürr, Goldstein, and Zanghi 2018). Thus, while metaphysicians, on their view, should end their criticism of the non-spatial theories, metaphysicians are of course welcome to spend their time on the metaphysical implications of other theories of quantum gravity. However, according to naturalized metaphysics, science will decide which of these that will be vindicated and not some a priori argument to the effect that one or the other theory is metaphysically impossible.

not be abolished but reformed” (p. 143).⁶⁸ The constructive component of naturalized metaphysics involves the introduction of new science-informed approaches to metaphysics that can replace those illicit methods traditionally employed in metaphysics while preserving the subject matter and thus ambitions of metaphysics.⁶⁹ Where metaphysical anti-realists are critical of metaphysical questions – for instance describing them as “devoid of cognitive content” (Carnap 1950, 28) – naturalized [p. 12] metaphysics is critical of how we go about answering metaphysical questions. For naturalized metaphysics, the questions themselves are not the problem. However, as Ladyman (2017) qualifies, “[t]hat is not to say that [naturalized metaphysicians] advocate answering all the same questions that are asked by analytic metaphysicians by different means” since some of them are “making insufficient contact with reality to be worth entertaining” (p. 143). Some – perhaps even many – metaphysical questions are (currently) epistemically unsafe to answer since the process of answering them will not be sufficiently inspired and constrained by science to satisfy the standards of naturalized metaphysics. However, it is still such *epistemic* concerns that are, or at least should be, behind the dismissive attitude towards metaphysicians quarrelling with science.

This must also apply when Lewisians ask about the world-making relation, propose distance as an answer, and then caution against non-spatial theories of quantum gravity in the absence of an alternative to distance. Recognizing that the aim of naturalized *metaphysics* is metaphysics, the problem with this conflict is *not* the metaphysical question behind it: what is the world-making relation? Rather, the issue concerns the methods that are employed to promote the conflict, i.e. the intuitions and a priori reasoning – the metaphysicians’ “hunches” – that enter the argument to the effect that distance is indispensable. There is certainly some merit (at least from a naturalistic perspective) to the view that it is ill-advised to attach too much significance to our apparent inability to imagine a world without space; especially considering the poor track record of success for proclamations about metaphysical possibility. However, a priori arguments for the indispensability of distance are not the decisive elements in

⁶⁸ The elimination of metaphysicians is not a characterizing feature of naturalized metaphysics either. Naturalized metaphysics does not recommend that metaphysicians should become scientists and adopt the methods of science in metaphysics; it is not characterized by this type of methodological naturalism despite some authors claim to the contrary (e.g. Esfeld 2018; Hudson 2016).

⁶⁹ Ney (2012), for instance, sees the task of naturalized metaphysics to be “to establish conclusions about ultimate reality” (p. 76) and Ladyman and Ross (2007) argue that “no other sort of metaphysics counts as inquiry into the objective nature of the world” (p. 9). In this respect, naturalized metaphysics differs from other recent attempts to salvage metaphysics that instead adopt more modest ambitions on behalf of the content of metaphysics (e.g. Hofweber 2016b; Kraut 2016; Thomasson 2015).

for instance Esfeld's caution against the non-spatial theories of quantum gravity. As discussed in Section 5.2, Esfeld's caution is motivated by the absence of an alternative to distance as a world-making relation and he explicitly recognizes that the "[t]he claim that there are no fundamental spatiotemporal relations could be true" (Esfeld 2019, 2). This conflict is, in other words, not (only) the result of an a priori preference for distance as the world-making relation, as Lam and Wuthrich seem to suggest, but rather mostly driven by the apparent lack of any other answer to the metaphysical question. While the absence of space at the fundamental level in for instance loop quantum gravity entails that distance cannot be the world-making relation, it is not manifest in the usual presentation of the theory what other relation makes it true that the elements of the ontology are worldmates. Consequently, the Lewisians, in their conflict with these non-spatial theories of quantum gravity, are not simply stubborn, but rather they stand their ground since these theories only provide a negative answer to their metaphysical inquiry.

In this respect, the conflict, and the Lewisians' Parmenidean resistance, is different from conflicts where a metaphysical interpretation of the scientific theory is available but simply disliked by some metaphysicians. An (admittedly contentious) example for the latter is when relativity theory apparently sides with eternalism and the B-theory of time against the A-theory of time in the form of either presentism or the growing block universe. The potential conflict between presentists and relativity theory is of a different kind than that discussed presently and exemplified by the conflict between Lewisians and non-spatial theories of quantum gravity. With respect to the question of how to conceive of time, relativity theory has an [p. 13] apparently consistent metaphysical interpretation in eternalism, whereas non-spatial theories of quantum gravity have no such interpretation with respect to the question of world-making. We might say that science in cases like that of relativity theory is not actually in conflict with metaphysics, but rather in conflict with one side in a metaphysical debate. By the standards of naturalized metaphysics, metaphysicians quarreling with scientific theories because they dislike the metaphysical view favored by the theory should probably just yield (though this issue is of course much less clean once we recognize that the metaphysical implications might be contentious and possibly underdetermined).

In comparison, Lewisians' resistance to non-spatial theories is not merely an expression of preference for space-based ontologies (though this might, of course, still have a place as Lam and Wüthrich suggest). If a presentist were to give up her conviction in the sole existence of the present and only preserve her question about the nature of time, the conflict with relativity theory would

immediately dissipate by the question being answered with eternalism.⁷⁰ The same would not be the case for Lewisians. If not the conflict itself, then much of the tension between metaphysics and science would persist even if the contentious positive proposal that distance is the world-making relation were left behind. Moderate Lewisians – which might very well include Esfeld – could simply be cast as asking, ‘what makes it true that we are worldmates in non-spatial theories of quantum gravity?’, but only receiving the answer ‘not spatial distance’. Since naturalized metaphysics does not in general renounce the meaningfulness or acceptability of metaphysical questions, Lewisians can certainly *hope* for an answer to their question and insist that we continue searching for one.

To remain true to the spirit of naturalized metaphysics, however, this search should be sensitive to signals from the scientific theory that the question is not epistemically safe to answer or that it is posed in such a way that the scientific theory must be appropriated or “domesticated”, as Ladyman and Ross call it, to the metaphysical purposes of our question:

An aspect of leaving science undomesticated is recognizing that it itself may tell us that there are questions we absolutely cannot answer because any attempted answer is as probable as any other. This does not imply that we should look to an institution other than science to answer such questions; we should in these cases forget about the questions (Ladyman and Ross 2007, 30).

We should accept that some metaphysical questions are not answerable and as at least implicit from this remark, some metaphysical questions may in their very formulation presume metaphysical assumptions that could render the questions inapplicable to the considered scientific theory. [p. 14]

Circumstances may, in other words, be such that a metaphysical question must ultimately be left unanswered, but pressing the question initially promises to be a good way of finding this out. As such, the Lewisians’ stubbornness enforces a tension – an echo of a conflict – which ensures that a positive answer to the question about world-making is pursued. Though the Lewisians might not be entitled in their preference for distance as the world-making relation due to its origin in the problematic traditional methods of metaphysics, their Parmenidean

⁷⁰ Arguably, A-theorists might simply insist that relativity theory with eternalism does not provide a satisfactory answer to their metaphysical question and that there consequently is no alternative answer to that question. It is admittedly unclear who shall serve as arbiter in such cases. There is therefore a risk that allowing for conflicts between science and metaphysics as a whole will prove to sanction any conflict between metaphysics and science contrary to what is the intention of this proposal.

resistance ensures the reassertion of the metaphysical question: what replaces distance as the world-making relation in the non-spatial theories of quantum gravity? More generally, they are partaking in an overarching aspiration that scientific theories need a coherent metaphysical interpretation that goes beyond merely negative replies to metaphysical inquiries; an aspiration that should be acceptable to and shared by naturalized metaphysics as long as it keeps away from the contested methods of traditional metaphysics and is careful to avoid domestication of the scientific theories. Unless we allow for some Parmenidean resistance, we might overlook when scientific theories have disclosed hitherto inconceivable metaphysics.⁷¹

Metaphysicians' outspoken conflicts with scientific theories serve to remind us to seek positive answers to our metaphysical questions and not be content with negative ones. As such, conflicts between science and *metaphysics as a whole* (and not just one side of a metaphysical debate) are signals of when science leaves metaphysical questions unanswered. In so far as naturalized metaphysics aspires to answer metaphysical questions, conflicts between metaphysics and science should therefore be welcomed as occasions to do (more) naturalized metaphysics. This apology for *conflicts* between metaphysics and science does as such not offer any vindication for prioritizing the views of a priori metaphysics over those science (or science-based metaphysics). But a priori metaphysics – through its conflicts with science – is nevertheless argued to be important and useful when naturalized metaphysics tries to develop a metaphysics informed by our best scientific theories. In this sense, the present proposal could be regarded as adding another function of a priori metaphysics to French and McKenzie's (2012) toolbox-approach to metaphysics, where the methods and frameworks developed within traditional a priori metaphysics are appreciated for their usefulness as tools that the naturalized metaphysicians can employ for various purposes in their scientifically informed and constrained metaphysics (for further discussion, see French and McKenzie (2016), Ross (2016), Le Bihan and Barton (2018), and French (2018)). [p. 15]

⁷¹ Though presenting it somewhat differently, Norton (2020, 1966–71) offers four historical examples where science came into conflict with firmly held metaphysical beliefs and how these conflicts lead to what he describes as “conceptual revolutions”. In our terms, these conflicts, as documented by Norton, were used as heuristics for the development of new naturalized metaphysics. Norton (2020, 1971–80) also accounts how non-spatial theories of quantum gravity suggest a reconfiguration of the distinction between concrete and abstract objects which might be seen as yet another example where a conflict between metaphysics and quantum gravity drives important developments in metaphysics.

5.4 THE WORLD-MAKING RELATION IN QUANTUM GRAVITY

The Lewisians can be cast as inquiring what replaces distance as the world-making relation in non-spatial theories of quantum gravity; a legitimate question – even by the standards of naturalized metaphysics – with no immediate answer. In general terms, Lewisians’ worry about the metaphysical coherence of a scientific theory and the resulting conflict – like other conflicts between metaphysics and science – can be received as indicating a possible open problem relating to the metaphysical foundation the theory in question. This section will show in more detail – by the example of the conflict between Lewisians and non-spatial theories of quantum gravity – how such metaphysical worries can be utilized as a heuristic in naturalized metaphysics. More precisely, it shows how the Lewisians – and Esfeld in particular – with their Parmenidean resistance bring attention to the interesting metaphysical question: what replaces distance as that which connects the elements of the ontology in non-spatial theories of quantum gravity? Based (primarily) on reasoning coming from string theory, I have elsewhere given the details of how entanglement can serve as an alternative world-making relation (Jakslund 2021a). The present account echoes this answer in terms of entanglement, but it does so based on loop quantum gravity which has been the primary example of a non-spatial theory of quantum gravity in the debate between Esfeld (2019) and Lam and Wüthrich (2020). While this perspective from loop quantum gravity nicely supplements the other arguments in favor of entanglement as the world-making relation, the aim here is first and foremost to show how this work plays out as a naturalized metaphysics driven by the Lewisians’ conflict with non-spatial theories of quantum gravity such as loop quantum gravity. In particular, the present account will indicate how answering the Lewisians’ question about world-making – to abide by the standards of naturalized metaphysics – requires the negotiation between constraints coming from the scientific theory and the presuppositions that are implicit in this metaphysical question.

For an ontology of objects in space, distance is an exemplary world-making relation: Every object is at a distance from any other object such that the distance relation can make it true that the two objects are worldmates. In addition, a coherent world-making relation should, according to Esfeld (2020), “(a) do the trick of individuating simple objects and (b) be empirically adequate” (p. 1892). This already exposes a dilemma for our investigation: how much and what aspects of the metaphysical question should be preserved? When asking a metaphysical question of a scientific theory, it is always a possibility that the question is explained away as misconstrued rather than answered. The scientific theory might simply expose that the question is asked on false premises or relies on inappropriate metaphors. In so far as the interesting new metaphysics is due to the answers, it is important that the metaphysical question is well-posed. In

the formulation of the question, Esfeld presupposes a metaphysics of individual objects; this is part of what the world-making relation should make sense of. While empirical adequacy seems to be a relevant minimal requirement, individuating simple objects – especially since Esfeld (2020, 1893) [p. 16] requires absolute discernibility⁷² – comes with the type of metaphysical prejudices that risk rendering our questions ill-posed. More generally, if we attempt to preserve too many of our metaphysical intuitions when answering the metaphysical question driving the conflict, then this might preclude the metaphysical novelties of the theory and in addition move us towards the domestication of science that naturalized metaphysics warns against. The ambition must not be to satisfy stubborn metaphysicians, but to use the conflicts between metaphysics and science as an occasion for open-minded exploration.

It seems to me that there is never a guarantee that a metaphysical question is well-posed, since it can never be completely detached from any metaphysical background assumptions. Even asking for a world-making relation without any assumption about the nature of the relation relies on there being a relation in some recognizable sense. The result of the exploration of the non-spatial theories of quantum gravity might therefore be that also this question is misguided. Still, this absence of relations would be a metaphysical discovery, especially if accompanied by indications of how to construe worlds without relations, and the pursuit of the metaphysical question behind the conflict between metaphysics and science would have yielded interesting insights. I do, however, think that Esfeld and the Lewisians' question about the world-making relation in quantum gravity can be answered, at least if it is stripped of its object ontology prejudices.

The proposal of distance as the world-making relation provides us with two hints on what to look for. First, we are looking for a relation that relates every pair of elements of the world (though these may not be recognizable as objects in any strict sense). Second, distance is a likely world-making relation which suggests that whatever distance derives from in these non-spatial theories is a likely candidate as well. Following this second hint, we shall look at how space is supposed to⁷³ emerge from the spin-networks of loop quantum gravity.⁷⁴ As stated in Section 5.2, the spin-networks are at the outset an abstract graph structure with a spin ($SU(2)$) representation for the nodes of the graph and one for the links. From this, one can construct a Hilbert space that defines the states

⁷² See Saunders (2006) a discussion of types of individuation in the context of quantum mechanics.

⁷³ None of these approaches are yet rigorous and they can therefore not say with absolute certainty how space emerges.

⁷⁴ This exposition is partly based on Rovelli (2011).

of loop quantum gravity. The route towards space goes via Penrose's (1971) spin-geometry theorem which implies that each node can be associated with a polyhedron; a geometrical object with polygonal faces that is uniquely described by the areas and angles between its faces. More precisely, one can for each link construct a scalar from spin operators. Each node is thus associated with as many such scalars as it has links and with the additional requirement of gauge invariance of the spin representation, these scalars of each node uniquely determine a polyhedron where the scalars are identified with the areas of the faces. The angles between the faces can, together with the areas, then be used to define a three-dimensional metric and the volume of the polyhedron. The angles, along with the other properties, are still quantum and thus associated with non-commuting operators: "the shape of a quantum polyhedron is fuzzy" [p. 17] (Bianchi 2017, 112). However, under additional coherence conditions (for details see Bianchi et al. (2011)), the areas take precise values and the expectation value of the angle operators approximates the classical angles. The polyhedra thus become semi-classical and each node together with its links can in this way receive a geometric interpretation as a chunk of space whose volume and metric is determined by the spin-network: "the algebraic structure [of the spin representation] determines the existence of a metric at each node and therefore equips each quantum of space with a geometry" (Rovelli 2011, 4). Each node is linked to other nodes, and on the geometrical viewpoint this can be conceived as polyhedra adjacent to one another. In this way, a cellular space of many polyhedra can emerge from the spin-network. It is intriguing to imagine how this, despite its granularity, may approximate a smooth space, just like a regular dodecahedron – the Platonic solid consisting of twelve pentagons – may look round from afar. However, even from afar – and thus disregarding the granularity due to the polyhedra – the metric of this space is discontinuous. In the spin-network, any two linked nodes have a geometrical interpretation as two polyhedra facing each other. Since they share the same link, the faces have the same area, but since generic nodes have a different number of links to other nodes, the shape of and angle between the faces will be different even though they have the same area; they are not shape-matched. As a consequence, the metric is generally discontinuous (Bianchi, Doná, and Speziale 2011, 11).

In a paper with Antonio Vassallo, Esfeld speculates how such networks of polyhedra or – "atoms of space" as they call them – might be connected up to form a continuous space. However, they also implicitly recognizes that spatial distance – or generally "metrical properties" – are absent at this fundamental level of networks of polyhedra: "grouping the atoms of space together in a suitable manner as represented by nodes and edges on a graph makes it possible for the configuration to instantiate metrical properties, while the individual atoms of space are connected only by a contiguity relation" (Vassallo and Esfeld

2014, 10).⁷⁵ Thus, also Esfeld seems to agree that distance cannot be the world-making relation in loop quantum gravity. The referred to “contiguity relation” amounts to little else than noting that the polyhedra in the spin network representation are connected by links in the graph. And while this may be visually intriguing, it is just another way of representing the formalism. Proposing this contiguity relation as the world-making relation – which Vassallo and Esfeld do not do either – seems equivalent to simply stating the loop quantum gravity formalism as an answer.⁷⁶ As already advertised, I think we can do better than that by considering how space emerges from the initially disconnected metric of contiguous polyhedra.

Continuous (though still cellular) spaces, known as Regge geometries, correspond to special spin-network states where faces are shape-matched and aligned. [p. 18] Recent research suggests that entanglement between the nodes of the spin-network plays an important role for this effect.⁷⁷ One can understand the role of entanglement by remembering that we are dealing with quantum polyhedra: just like an electron can be in a superposition state of spin up and down, a quantum polyhedron can be in a superposition of various shapes. Two adjacent polyhedra, i.e. polyhedra sharing a link in the graph, both in such a superposition state might have the same spectrum of shapes, but upon collapsing the superposition they can collapse on different shapes: “their geometry has uncorrelated fluctuations. At the classical level this behavior corresponds to a twisted geometry—the geometry of a collection of polyhedra with uncorrelated shapes” (Baytaş, Bianchi, and Yokomizo 2018, 15). Considering electrons again, the collapse of the superposition state of two electrons can be correlated by entanglement, i.e. they are correlated if they are prepared in an inseparable state such as the Bell state. The same goes for spin-networks. Entangling neighboring nodes produce correlations between the polyhedra and therefore looks to be a necessary condition for the alignment and shape-matching of the faces. Baytaş, Bianchi, and Yokomizo (2018) conclude: “The results presented show clearly the role of entanglement in the gluing of quantum regions of space” (p. 16). It seems, in other words, that in loop quantum gravity entanglement is responsible for the emergence of the continuous cellular space that “from afar” will look like a (semi-)classical space.

⁷⁵ Vassallo and Esfeld’s ontology comprising of these atoms of space might be an interesting candidate for the elements in an ontology with entanglement as the world-making relation, but working out this proposal will be postponed to future work.

⁷⁶ Arguably, more can and should be said about this issue, but this will be postponed for future work.

⁷⁷ More precisely, it can be shown that the twistor geometry of generic spin-network states becomes a vector geometry (of which Regge geometries are a subset) by entangling the nodes of the network with their nearest neighbors (Baytaş, Bianchi, and Yokomizo 2018).

Entanglement appears to connect the “quantum regions of space” in the form of polyhedra. Even though these polyhedra or their related nodes bear little resemblance to objects as we know them, entanglement thus fills a role similar to that of distance in connecting the elements of the ontology. Entanglement is interesting in this regard, since it shares some of the features that made distance a likely world-making relation (Jakslund 2021a).⁷⁸ First, entanglement is an extrinsic property; something is entangled with something *else*. Second, entanglement shares the universality of distance: distance can relate everything in space to everything else and likewise, entanglement can obtain between any quantum degrees of freedom. Presuming that all degrees of freedom are quantum in *quantum* gravity, this entails that all degrees of freedom can be entangled in such theories. Furthermore, results coming out of algebraic relativistic quantum field theory indicate that all degrees of freedom not only can be but actually are entangled which testifies to the pervasiveness of entanglement. More precisely, Redhead (1995) shows that in the vacuum state all spacelike separated subsystems – all the subsystem that are also connected by a distance – are highly entangled and this result is generalized to generic states by Clifton and Halvorson (2001) who also show that no local operation can disentangle spacelike separated subsystems (see Lam (2013) and Swanson (2019) for further details). Third, entanglement is, via entanglement entropy and mutual information, [p. 19] quantifiable as a non-negative scalar just like distance. Given these features and its role in loop quantum gravity, entanglement is a promising replacement for distance as the world-making relation. Entanglement might be the relation in virtue of which the elements of the spin-network make up a world and that thereby is the relation that glues together the fundamentally non-spatial worlds of loop quantum gravity. While the non-spatial theories of quantum gravity had so far only provided the negative answer that distance is not the world-making relation, the Parmenidean resistance of Lewisians has motivated the (preliminary) development of new metaphysics in the form of an entanglement fundamentalism hitherto unseen in the metaphysics literature.

The proposal that entanglement might be the world-making relation in loop quantum gravity is claimed to qualify as naturalized metaphysics. It is a proposal that answers a metaphysical question but whose answer is motivated by a scientific theory. In being relative to loop quantum gravity, the proposal does not say anything of what is and certainly not what must be the case in actual

⁷⁸ Lewis specifically argues that if space is to be replaced, it must be replaced by a relation that is analogous (in a specified sense) to a spatiotemporal relation. A more detailed discussion of the extent to which entanglement satisfies Lewis’ condition for an analogous spatiotemporal relation will be postponed to future work. See, however, Wüthrich (2019) for some preliminary remarks about analogously spatiotemporal relations in quantum gravity.

reality. Following the deference to science in naturalized metaphysics, it is science that determinates what is and what is not the case. The claim is therefore that if loop quantum gravity is eventually vindicated, then entanglement *might* be the answer to the question ‘what makes it true that we are worldmates’. Again, following the spirit of naturalized metaphysics, ‘might’ is emphasized since the thesis should be considered fallible and furthermore, more research might reveal that this question about world-making is after all epistemically unsafe to answer in loop quantum gravity by the standards of naturalized metaphysics or that the question may be prone to domestication.

In connection with the latter, two warnings are in place: (1) Even though entanglement is offered as an answer to a metaphysical question, this answer originates in the serious engagement with a physical theory and for this reason, entanglement does not carry any significance beyond its role in gluing polyhedra in loop quantum gravity. Even though it is brought to bear on this metaphysical question, it does so as an element of the theory under scrutiny that is picked as a candidate answer to our metaphysical inquiry and its use in metaphysics must remain true to this origin to abide by the standard of naturalized metaphysics. (2) Esfeld might insist that entanglement is not a satisfactory world-making relation since it does not appear to individuate simple objects and it cannot provide for separable subsystems. Now, it may of course be that we have not found the right world-making relation in loop quantum gravity, but it seems more likely that the metaphysical question, and especially our expectation for the answer, must be adapted to what the theory provides. In this sense, answering metaphysical questions posed at scientific theories must take the form of a negotiation between our metaphysical aspirations and the details of the theory. The theory might ultimately indicate that parts of the metaphysical question were ill-posed, such that these aspects are explained away rather than answered. However, metaphysical lessons are learned under both circumstances whereby the conflict driving the investigation has proving useful to naturalized metaphysics. [p. 20]

5.5 CONCLUSION

The introduction claimed that few today would side with Parmenides and metaphysical doctrines against the senses and, by extension, science. This is probably for the best, but maybe a Parmenidean resistance of the right sort can still be beneficial. The history of science has been full of metaphysical surprises. Often, science has explicitly proven our metaphysical preconceptions wrong, quantum mechanics being an example. Science, however, is rarely similarly explicit about what metaphysical theory should take the place of our preconceptions; the industry of interpreting quantum mechanics nicely

illustrates this difference. If we follow the tenet of naturalized metaphysics, metaphysicians should not start quarrelling with science over these lost preconceptions: metaphysics should yield to science. However, if we simply dismiss the metaphysicians like this, we lose one side of science's contribution to metaphysics: whereas science will still prove our metaphysical preconceptions wrong, we risk continuing without putting any new metaphysics in their stead if we silence the metaphysical questions behind the conflicts between metaphysics and science. A Parmenidean resistance should be maintained until science has an alternative *positive* metaphysical story to tell.

Such a resistance was specifically advised in circumstances where there is no known metaphysical framework that is consistent with the scientific theory. While some scientific theories simply side with one side of a metaphysical debate, other conflicts – such as that of Lewisians against non-spatial theories of quantum gravity – can be construed as a conflict between science and metaphysics as a whole. It is these conflicts that are valuable as indicators where science has only provided a negative answer and where there is consequently more work to do for naturalized metaphysics. Only by asking the metaphysical questions will we disclose the hitherto inconceivable metaphysics with which science replaces our metaphysical preconceptions. A bit of Parmenidean resistance ensures that we do so, and naturalized metaphysics should therefore welcome conflicts between metaphysics and science as a resource for metaphysical development. Section 5.4 showed how to carry this out in the context of loop quantum gravity – a non-spatial theory of quantum gravity – with an emphasis on what replaces distance in that theory as the world-making relation. The suggestion was entanglement; an answer arrived at as an equilibrium between the details of the scientific theory and the metaphysical aspirations of the question.

6 ELIMINATING THE METAPHYSICIAN TO SAVE METAPHYSICS

As discussed both in the previous chapter and in chapter 3, the ambition of naturalized metaphysics is to answer metaphysical questions and thereby arrive at justified metaphysical claims. This led in the previous chapter to the somewhat liberal construal that naturalized metaphysics should in general take a permissive attitude towards metaphysical questions. However, we also noted that Ross considers such lenience towards autonomous metaphysics as running an unnecessary epistemic risk. This chapter argues that naturalized metaphysics may indeed have to adopt the more restrictive approach advocated by Ross if it is to succeed with generating metaphysical justified metaphysical claims rather than mere metaphysical possibilities. The reason is the underdetermination of metaphysics by science which critics of naturalized metaphysics argue permeates most, if not all, scientific theories. Taking the same approach as elsewhere in this thesis, this underdetermination will neither be questioned nor defended. Instead, the aim is to explore what consequences this problem has for naturalized metaphysics when also assuming its core tenets: that the traditional methods of metaphysics are epistemically illegitimate but that the epistemic credibility of science is such that it can provide warrant for metaphysical claims.

This last commitment is stated a little more carefully here than earlier to make clear that the assumption of metaphysical underdetermination does not amount to rejecting that science can warrant metaphysics. The underdetermination of metaphysics by science introduces a complication when inferring metaphysical conclusions from scientific theories. The epistemic standing of science, however, remains unchanged. Should science, in other words, imply a unique metaphysics, then this metaphysics would be justified in accordance with the core commitment of naturalized metaphysics. The problem due to underdetermination, however, is that the metaphysics in most cases is not unique. Thus, besides the arguments for the epistemic standing of science discussed in section 3.5, an additional argument is needed for how to overcome the underdetermination of metaphysical by science, at least if naturalized metaphysics shall deliver on its promise to arrive at answers to metaphysical questions and not mere possibilities.

One way of overcoming underdetermination is by being more restrictive about what counts as a serious metaphysical alternative. This attitude accords well with Ross' proposal from chapter 5 to take a more cautious approach to naturalized metaphysics to minimize the risk of metaphysical Trojan horses. Such Trojan horses, one might well worry, will be more frequent if the

underdetermined alternatives are developed by metaphysicians since these might be motivated, not by science, but by metaphysical preconceptions. Restricting like this what can be considered a serious metaphysical alternative might limit the pervasiveness of underdetermination, especially because this more restrictive approach would eliminate gerrymandered alternatives put forward only for the purpose of generating underdetermination. This, in other words, raises the hopes that some metaphysical features will not in fact be underdetermined.

This chapter, however, argues that this restrictive approach to naturalized metaphysics is also the only way naturalized metaphysics can overcome the underdetermination problem. While two other solutions are proposed in the literature, both, it is argued, ultimately have to rely on the traditional methods of metaphysics, and they are thus prone to introduce more Trojan horses. The first of these is to break metaphysical underdetermination using the same methods with which we arbitrate between alternative scientific theories, more particularly by means of theoretical virtues. While naturalized metaphysics accepts the use of theoretical virtues in science, they are rather critical of their use in autonomous metaphysics, as also discussed in section 3.5. This therefore raises the question whether their use to arbitrate between underdetermined metaphysical alternatives share in their legitimate use in science or their illegitimate use in metaphysics. Without a convincing argument that the former is the case, this solution to the underdetermination problem is, as announced, at risk of violating the standard of naturalized metaphysics.

The other solution seeks to undermine underdetermination by showing that metaphysics merely *appears* to be underdetermined by science. The proposal, more particularly, is that only the shared structure between the underdetermined alternatives is real, and the appearance of underdetermination is an artifact of our bias towards object ontologies. This solution to the underdetermination problem faces the challenge of defending that only the shared structure is real. Again, the worry is that such an argument will have to rely on the illegitimate traditional methods of metaphysics. How, we might ask, would naturalized metaphysics go about showing that objects are not real without resorting to extra-scientific resources when the metaphysical alternatives that they appear in seem to be compatible with the scientific theory in question?

While these considerations concern the different reactions to the underdetermination problem in naturalized metaphysics, the chapter is framed around the question whether naturalized metaphysics, to save itself from the underdetermination problem, has to eliminate anything that resembles doing metaphysics. This question is ultimately answered in the affirmative due to the

very restrictive approach to naturalized metaphysics that proves necessary to overcome the underdetermination problem. Framing the discussion like this is an occasion for this chapter to substantiate what it means to do metaphysics and how much of this practice that can be continued within naturalized metaphysics. This discussion of “doing metaphysics” also gives an opportunity to clarify that naturalized metaphysics, despite its criticism of a priori reasoning, is not against reasoning in general or deductive argumentation. This is partly the reason why this chapter finds that naturalized metaphysics, at least according to its core commitments, is relatively hospitable to doing metaphysics, though not all metaphysical activities can, of course, continue. This, however, changes once the restrictive approach to naturalized metaphysics is adopted to overcome the underdetermination problem. This chapter therefore concludes that naturalized metaphysics may have to eliminate the metaphysician to save metaphysics.

One may at this point worry about the internal coherence between this and the previous chapter. The problem is not underdetermination in itself. Depending on how pervasive it is, underdetermination can of course leave the answer to many of our metaphysical questions underdetermined. Possibly this includes the question about the world-making relation but so far, entanglement is the only answer to this question, and it therefore remains to be seen whether it is in fact underdetermined. The internal coherence problems rather originate with the restrictive approach to naturalized metaphysics that is here argued to be necessary for naturalized metaphysics to overcome the underdetermination problem. This approach bars the metaphysicians from generating metaphysical alternatives, arguing that such an origin makes these alternatives epistemically questionable, but by the same reasoning, metaphysicians are barred from deriving answers to their metaphysical questions as well. The only metaphysical questions that can be answered are those that are immediately answered by science. Thus, the process of teasing out what might be the world-making relation in loop quantum gravity in chapter 5 would be looked upon with suspicion by this more restrictive approach to naturalized metaphysics. Since it is the absence of an immediate answer to metaphysical questions that, chapter 5 argued, excuses the metaphysicians’ resistance to science, such resistance is also illegitimate on this more restrictive approach. The present chapter does, in other words, question these central points of chapter 5. This, however, is hardly surprising since the claim of the present chapter precisely is that underdetermination requires naturalized metaphysics to be more restrictive than it perhaps ideally would have wanted to be.

6.1 INTRODUCTION

Naturalized metaphysics is driven by a worry about the epistemic legitimacy of traditional analytic metaphysics and proposes to remedy this by a closer association between metaphysics and our current best sciences as prominently defended by James Ladyman and Don Ross (2007). In contrast with the criticism of metaphysics found among empiricists, naturalized metaphysics does not, however, argue that metaphysics is semantically defective (Ladyman 2017, 144). Ladyman and Ross insist that “[w]e cannot go back to anti-metaphysical positivism” and in their book *Every Thing Must Go: Metaphysics Naturalized* they remark that “[t]his book is not hostile to metaphysics; indeed, it is an exercise in metaphysics” (Ladyman and Ross 2007, 26). Naturalized metaphysics is, as such, not eliminative of metaphysics. Metaphysics – in a sense carrying all its usual significance – is meaningful and some of its claims, though not all, can be justified if they are properly informed, motivated, and constrained by science. “Scientism is usually thought of as sinful but it can be redeemed for our salvation,” as Ladyman (2018, 106) writes.

Naturalized metaphysics thus promises to save metaphysics, but this paper argues that this salvation comes at the price of displacing the metaphysicians. This conclusion is, in a sense, anticipated by L. A. Paul when she worries about naturalized metaphysics that “[a]t best, metaphysics is a handmaiden to science” (2012, 2). Likewise, Alyssa Ney asks rhetorically: “What work could there plausibly be for the metaphysician, if metaphysics and science address a common set of questions?” (2019, 17); especially if science always takes priority over metaphysics as naturalized metaphysics argues. This paper can thus be seen as substantiating these worries. More precisely, it argues that the attempts within naturalized metaphysics to overcome the challenges due to the underdetermination of metaphysics by science leaves nothing recognizable as metaphysics left to do for metaphysicians.

Despite its explicit endorsement of metaphysical realism, naturalized metaphysics therefore ends up in the company of more eliminative views of metaphysics – often associated with the most radical interpretations of Carnapian (1950) deflationism – which argues that anything resembling the existing metaphysical practice is “a waste of time, and should thus be deleted from our repertoire” (Kraut 2016, 35). The paper therefore proposes that metaphysicians might be no better off with naturalized metaphysics than they are with Carnapian deflationism. Metaphysicians who want to do metaphysics should not look to naturalized metaphysics for their salvation.

Notice that this argument does not depend on advancing new challenges to naturalized metaphysics. Rather, the problem with doing anything that resembles metaphysics within naturalized metaphysics results from the

ambition to establish justified metaphysical claims without resorting to the traditional methods of metaphysics. This displacement of metaphysicians is as such internal to naturalized metaphysics and thus implicit in most of its expositions.

The paper proceeds as follows. Section 6.2 gives a brief outline of the central commitments of naturalized metaphysics. These are taken to be the criticism of the traditional methods of analytic metaphysics and a strong deference to science to replace them. Section 6.3 explicates what ‘doing metaphysics’ means in the present context and argues that naturalized metaphysics, at the outset, is hospitable to this activity. Section 6.4 introduces the problem of the underdetermination of metaphysics by science. It explores various strategies for overcoming this problem within naturalized metaphysics but finds that looking for metaphysical features that are not in fact underdetermined is the only viable one. Section 6.5, however, argues that this strategy leaves no room for doing metaphysics. Chapter 6.6 adds that Ladyman and Ross’ proposed re-employment of metaphysicians through the principle of naturalistic closure does not change this, and the paper therefore concludes that naturalized metaphysics displaces metaphysicians to save metaphysics.

6.2 NATURALIZED METAPHYSICS

Naturalized metaphysics is propelled by a worry about the epistemic legitimacy of the methods traditionally employed when answering metaphysical questions. Metaphysics, it is argued, has largely depended on intuitions, common sense, conceptual analysis, and a priori reasoning but since these faculties are the results of biological evolution,⁷⁹ naturalized metaphysics argues that they furnish no faculty providing insights about ultimate reality. Rather, these methods are adapted for “making navigational inferences in certain sorts of environments (but not in others), and [...] anticipating aspects of the trajectories of medium-sized objects moving at medium speeds” (Ladyman and Ross 2007, 3). Furthermore, these traditional methods of metaphysics have had little success with their speculations about ultimate reality, and continuing such speculation is thus “ignoring the fact that science, especially physics, has shown us that the universe is very strange to our inherited conception of what it is like” (Ladyman and Ross 2007, 10; see also Humphreys 2013, 56–58). On these grounds, Ladyman and Ross conclude that “there is no reason to imagine that our habitual intuitions and inferential responses are well designed for science or

⁷⁹ For a discussion, see Faye (2016).

for metaphysics” (2007, 3).⁸⁰ According to naturalized metaphysics, the traditional methods of metaphysics are, in other words, too epistemically unreliable. A metaphysics is therefore epistemically credible only if it avoids using them. Amanda Bryant adds that “autonomous metaphysics” – as we shall also here denote science-independent metaphysics – based on these methods is not only futile but “harmful to the extent that its proponents believe it to be an epistemically adequate form of inquiry that produces justified theories about the nature of the world” (2020a, 17–18). Since the purpose of this paper is to investigate the consequences for metaphysics *assuming* this criticism of its traditional methods, whether this criticism is warranted will not be discussed any further here.

Naturalized metaphysics, like most other naturalisms (Jacobs 2019), is a revisionary program that, though it identifies a problem in the existing practice, also offers a remedy: a closer integration between metaphysics and science. More precisely, Ladyman and Ross qualify that their “[n]aturalism requires that, since scientific institutions are the instruments by which we investigate objective reality, their outputs should motivate all claims about this reality, including metaphysical ones” (2007, 30). The distinction, as Anjan Chakravartty describes it, is that “[n]aturalized metaphysics is metaphysics that is inspired by and constrained by the output of our best science. Non-naturalized metaphysics is metaphysics that is not so inspired or constrained” (2013, 33; see also Maudlin 2007b, 1; Ney 2012, 76). The proposal, in other words, is that a metaphysics that is motivated, inspired, and constrained by the *output* of science can succeed where a metaphysics based on the traditional methods fails. Naturalized metaphysics can generate justified metaphysics claims.

Though proponents of naturalized metaphysics are critical of the traditional methods of metaphysics, they still want to preserve metaphysics and its traditional aims. In contrast to eliminative programs such as logical positivism, Ladyman insists in his apology for naturalized metaphysics that “metaphysics should not be abolished but reformed” (2017, 143; see Soto 2015, 47 for a discussion). The naturalization of metaphysics involves the introduction of new science-informed approaches to metaphysics that can replace those illegitimate methods traditionally employed in metaphysics while preserving the subject matter and thus ambitions of metaphysics. In agreement with a typical explication of metaphysics as “the study of ultimate reality” (van Inwagen 2015, 1), Ney, for instance, sees the task of naturalized metaphysics to be “to establish conclusions about ultimate reality” (2012, 76) and Ladyman and Ross argue that

⁸⁰ Dorr (2010) has argued that metaphysics does in fact not employ these methods. Tallant (2013; 2015) objects that especially intuitions also plays a central role in physics. See Ladyman (2017) for a discussion of these criticisms.

“no other sort of metaphysics counts as inquiry into the objective nature of the world” (2007, 9). Other proponents of naturalized metaphysics signify that their use of ‘metaphysics’ is co-extensive with its traditional use: “*metaphysics* is whatever it is that we do in metaphysics anthologies, journal articles, and classrooms” (Bryant 2020a, 3; see also Hawley 2006, 452). ‘Metaphysics’ in ‘naturalized metaphysics’ is meant to carry its usual significance.

Thus, naturalized metaphysics seems to endorse metaphysical realism and thus an inflationary conception of (the subject matter of) metaphysics. Naturalized metaphysics aims at justified claims about ultimate reality⁸¹ and in this respect, it differs from the attempts to salvage metaphysics that try to reconstrue its subject matter (e.g. Jenkins 2014; Kraut 2016; Strawson 1959).⁸²

6.3 DOING METAPHYSICS

Naturalized metaphysics, as discussed above, preserves the aim of metaphysics to study ultimate reality but criticizes the methods that have traditionally been employed by metaphysicians towards this aim. This promises two quick and opposing replies to the question whether naturalized metaphysics displaces the metaphysician. On the one hand, if a metaphysician is someone who does something that results in justified claims about ultimate reality, then naturalized metaphysics saves the metaphysicians as well as metaphysics (if, of course, naturalized metaphysics succeeds with this aim). On the other, if a metaphysician is someone who uses these traditional methods of metaphysics to answer questions, then it is hardly surprising if naturalized metaphysics eliminates the metaphysician. The aim here, however, is to propose a more subtle understanding of what a metaphysician does that, at the same time, is tolerant of changes to the metaphysical practice but remains continuous with it.

Metaphysicians have often expressed dissatisfaction with attempts by so-called “reformers” (Manley 2009, 4) to save metaphysics by altering the aims of metaphysics. Jonathan Lowe, for instance, considers the proposal “to understand the aim of metaphysics [...] as the attempt to analyse our currently accepted ways of talking” (1998, 2) but forcefully dismisses anyone undertaking such a project with the proclamation: “let us not pretend that in doing so we would be doing anything worth dignifying by the name ‘metaphysics’” (1998, 2; see also Bloomfield 2005, sec. 3; Cameron 2010, 17; Poidevin 2009, xx). Likewise,

⁸¹ See Bennett (2016) for a criticism of construing the aim of metaphysics like this and Hofweber (2016c) for a reply.

⁸² Hawley (2006) does argue that the type of conceptual scheme relativism often implicit in these other revisions of metaphysics is compatible with naturalized metaphysics, and a variant of this approach – a non-representationalist, naturalized metaphysics – is for instance developed by Knowles (2017).

the otherwise well-meaning proposals following Rudolf Carnap (1950) that metaphysics might be reconstrued as metalinguistic negotiation (e.g. Jenkins 2014; Kraut 2016; 2020; Plunkett 2015; Thomasson 2017a; 2017b) are, for instance, dismissed by Jessica Wilson. She distinguishes between “investigation into and disagreement about what it is most useful for us to take to exist, as opposed to investigation into and disagreement about what really does exist” but insists that “[m]etaphysics involves the latter, not the former” (J. Wilson 2011, 184; see also Hofweber 2016a, 26). For metaphysicians to recognize themselves in an attempt to revise metaphysics, the revision must keep with the traditional aim of metaphysics.

The point of some reformers, of course, is that the activity can largely continue as before if it is only recognized that the description of what is going on must be altered; for instance from investigating reality to investigating useful ways of talking (see in particular Kraut 2016). A way of capturing metaphysicians resistance to such reforms is through the condition that the reformed description of the activity must be dependent on the truth of metaphysical realism, i.e., dependent on the “availability of a ‘God’s-Eye’ point of view, from which we could compare our theories and belief about the world to the world itself, as it is independently of our conceptual systems” (Haukioja 2020, 67). While a discussion described as concerning the existence of numbers will be nonsensical if metaphysical realism is discovered to be false, a (re-)construal of it as the discussion whether number talk is useful will be left unscathed. In accordance with the intuition expressed by Lowe and Wilson, the former therefore qualifies as doing metaphysics but not the latter (irrespective of how similar to activities are).

However, preserving the aims of metaphysics or equivalently, doing something that is dependent on metaphysical realism, is arguably not sufficient for the revised activity to qualify as doing *metaphysics*. Metaphysicians must also have a sufficiently distinctive role to fill as part of inquiry. Thomas Hofweber distinguishes such partaking in inquiry from contributing more generally with the example that “[w]ashing the test tubes of the chemists is a useful contribution to inquiry, but it is not itself a proper part of inquiry, only a supporting role” (2016c, 43). Philosophers analyzing and improving the language of science – perhaps in the spirit of Carnap’s (1942, 250) “logic of science” – are not *partaking* in inquiry and therefore not doing metaphysics, even if the end result of the consequent scientific inquiry is truths about ultimate reality (Hofweber 2020, 428). Likewise, just reporting on such truths is insufficient, according to Hofweber. A metaphysics that merely “looks at the results of the sciences and their consequences without adding to them” (Hofweber 2016b, 296) is, in an echo of Lowe, “unambitious metaphysics [...] not worth the name” (Hofweber

2016b, 297). For an activity to qualify as doing metaphysics, it is necessary that it partake in the inquiry into ultimate reality *and* adds to it.

For this reason, Hofweber is also hesitant to regard it as doing metaphysics when the metaphysical findings are immediately derived, for instance, from science or, as Amie Thomasson's (2015) easy ontology proposes, the application conditions for our everyday language. While, for instance, mathematicians do not typically inquire about the existence of numbers themselves, Hofweber finds that "a paradigm case of a pointless project is to ask whether there are numbers even though the answer 'yes' is immediately implied by the results of mathematics. If the metaphysical questions are just like that, then there is nothing left to do" (2016b, 299). Speaking more specifically about Thomasson's easy ontology, Ross Cameron expresses the same sentiment when he notes that "[t]here is no work for the metaphysician here" (2020, 238). Ontology is easy, Thomasson (2015, 130) argues, since from the fact that a dress is red it follows that something has a property of being red which in turn implies that there are properties. While no-one other than the easy ontologist would likely bother to compile the list of what thereby exists, doing so would not qualify as doing metaphysics, at least if the rest of the ontology is immediately implied like this.⁸³ Even though it is this compilation work that – if Thomasson is correct – would result in metaphysical truths, the problem, following Hofweber and Cameron, is that nothing is added by the metaphysician that was not otherwise immediately implied. In Hofweber's analogy, the task of easy ontologist is analogous to cleaning the tubes or, perhaps rather, copying down the readings from the displays of the scientific instruments which by Hofweber's standards would not count as partaking in inquiry. The present discussion shall proceed on the assumption that the easy ontologist's inference to the existence of properties from the existence of a red dress does not qualify as doing metaphysics, a view at least shared by Hofweber and Cameron. Someone disagreeing with this view can read the subsequent sections as arguing that the work of the metaphysician in naturalized metaphysics is comparable to that of the easy ontologist in that example (and without the possible subtle role for the metaphysician in the latter due to conceptual ethics identified by Thomasson (2017b)).

⁸³ Thomasson does observe that 'easy' ontological inferences can require a lot of conceptual analysis and philosophical acumen to draw out: "though it counts as 'easy' ontology in the technical sense here (no epistemically metaphysical work is required), that is still not to say that it's easy in the sense that it can be done without much thought on an idle Sunday afternoon" (Thomasson 2015, 329–30). This might, in other words, entail that some easy ontology would after all qualify as doing metaphysics on Hofweber's account. Thus, when it is eventually argued here that naturalized metaphysics displaces the metaphysician in the way of easy ontology, the analogy is to the easy ontology of the dress example.

One might worry that a science-based metaphysics would fare little better. However, Hofweber, correctly I think, qualifies that there could be a substantive task for the metaphysician to undertake as soon as the answers to some metaphysical questions are not immediately implied by other parts of inquiry. Already “[i]f there was such an implication, but it was hard to see whether it obtained, then this would be different” (Hofweber 2016b, 298). Thus, the issue with easy ontology is not that the answers are ultimately implied by the application conditions for our everyday language but that it is too easy. Thus, to preserve the metaphysicians, and not only metaphysics, it is necessary for a revision of metaphysics, such as naturalized metaphysics, to leave some substantial work to do for the metaphysicians where they partake in and add to the inquiry into ultimate reality.

This job description, however, might as well be given of (semantic) realist physics as of metaphysics. But re-employing displaced metaphysicians as physicists can hardly qualify as leaving a place for doing metaphysics. Since Hofweber’s primary concern is to argue that metaphysics is a distinct discipline, he sidesteps such worries arguing that metaphysics is characterized by asking questions not asked by any other inquiry, though it has “no distinct subject matter, nor a distinct methodology” (2016b, 311). Thus, on Hofweber’s account, though he does not admit this possibility explicitly, one could be doing metaphysics through equations and experiments, if only the right questions were pursued. However, here I shall claim – and I allege that this is the attitude of most metaphysicians – that something cannot qualify as doing metaphysics if those who used to do it are now unable to, even with some retraining. To qualify as doing metaphysics, the revised metaphysical practice should be sufficiently continuous with the existing one.

So what is the existing practice? Karen Bennett provides some indication when she asks “[h]ow do metaphysicians go about their business?” and answers

They use a priori reasoning. They also use empirical claims [...]. They use thought experiments. They engage in counterfactual and modal reasoning. They track what entails what, and also use inference to the best explanation. They tease out consequences of views, and hidden contradictions. They reckon costs and benefits. They counterexample each other. They postulate entities to do various theoretical jobs, or account for some phenomenon. And so forth (Bennett 2016, 25).

To this list, we might add some themes from Daniel Nolan’s (2016) account of the methods in analytic metaphysics (which otherwise overlap with Bennett’s list): conceptual analysis, consulting intuitions, and reflecting on common sense.

With the criticism of the traditional methods of metaphysics it is hardly surprising that not all of these practices can continue in naturalized metaphysics. However, the remainder of this section will argue that it is not *prima facie* ruled out that naturalized metaphysics can be hospitable to doing metaphysics in the sense of it being a practice that partakes in and adds to the study of ultimate reality while being continuous with the existing metaphysical practice.

Many of the listed metaphysical activities could be categorized as a priori. Apart from explicit a priori reasoning itself, thought experiments, looking for contradictions, finding counterexamples, teasing out consequences, analyzing concepts, and reflecting on intuition might be given this label. If naturalized metaphysics finds all such a priori activities illegitimate, then there will after all be very little left that metaphysicians can legitimately do. Naturalized metaphysics, however, is specifically critical of the reliability of a priori reasoning and the traditional methods of metaphysics more generally *as evidence* in metaphysics. More precisely, metaphysics cannot be based on alleged synthetic a priori truths, intuitions, insights from conceptual analysis, or common sense if the aim is justified claims about ultimate reality. These, however, are not problematic because naturalized metaphysics generally doubts our ability to reason well. Irrespective of how good a conceptual analysis is, it will never, according to naturalized metaphysics, provide any justification for metaphysical claims. Indeed, in all four cases, the problem is that the source, in a sense, is contaminated from the outset. Nothing, by contrast, is inherently problematic about looking for contradictions, finding counterexamples, and teasing out consequences, even though these activities take place in the armchair. Though we are of course fallible when reasoning like this, any mistake can be identified and remedied by others. Denoting the latter ‘a priori methods,’ Tuomas Tahko (2020) reserve the name ‘a priori reasoning’ (as also done here) for those activities that allege to produce insights about the world (sufficiently) independently of experience, though Tahko (2020, 355) adds that the boundary may not be sharp.

At the very least, this tolerance for a priori methods should extend to the use of deductive inferences, and some proponents of naturalized metaphysics might extend this tolerance to abduction and even induction as well. Whether this allows for the use of thought experiments will likely depend on what one purports that thought experiments can show. But developing thought experiments should be an admissible activity even for the naturalized metaphysician if they are merely regarded as a vivid way to demonstrate consequences or contradictions of some set of propositions, what Sören Häggqvist (2009, 60) denotes “the argument view.”

Of the remaining activities mentioned by Bennett, Ladyman and Ross (2007, 12) dismiss cost-benefit considerations as an example of the use of intuitions. Relating to counterfactual and modal reasoning, Ladyman and Ross “deny that a priori inquiry can reveal what is metaphysically possible” (2007, 16). For all they say, however, if counterfactual and modal reasoning is regimented by the results of science, then it might be acceptable. Inference to the best explanation and the related positing of entities to do theoretical jobs is arguably borderline since they are not so different from cost-benefit analyses, but Ladyman and Ross (2007, 69) at the same time explicitly use inference to the best explanation in their defense of scientific realism. Despite these unclarities, the above seems to show that the criticism of the traditional methods of metaphysics does not defeat the possibility of continuing aspects of the existing metaphysical practice within naturalized metaphysics.

This, however, will be of little comfort to the metaphysician if these activities never come into play. The principal commitment of naturalized metaphysics is that the results of science must replace all other evidence in metaphysics, but this raises a worry – analogues to that realized in easy ontology – that science immediately answers all the admissible metaphysical questions. Two interrelated circumstances speak against this worry, though the subsequent sections will ultimately show that this worry is real in naturalized metaphysics. First, naturalized metaphysics is not – and should not be – eliminative of metaphysical questions, as Rasmus Jaksland (2021c, sec. 3) argues. Thus, there should be ample room for questions that are not immediately answered but where the implications of science for that question are at least “hard to see,” as Hofweber puts it above. This is especially so since scientific theories are typically constructed to answer questions internal to science that rarely coincide with the questions of interest to metaphysics. Scientific theories will therefore rarely answer metaphysical questions explicitly (see, e.g., Jaksland 2021c, 11–12). Thus, to “tease out consequences” of science for our metaphysical questions is a central task for the metaphysician in naturalized metaphysics and, importantly, one that the scientists neither have an interest in carrying out themselves, nor the skills since it will require doing metaphysics. That doing metaphysics is not ruled out in naturalized metaphysics is well illustrated by Ladyman and Ross’ (2007, chap. 3) defense of ontic structural realism in the light of quantum mechanics, which precisely seems to exemplify the activities that Bennett finds characteristic of metaphysics.⁸⁴ Naturalized metaphysics does, in other words,

⁸⁴ Ontic structural realism in the context of quantum mechanics has also been pursued under the label ‘philosophy of science,’ but following Nolan (2015, 164–65), there seems to be little purpose in differentiating the philosophy and metaphysics of science. Rather, the latter can arguably be seen as a metaphysical part of the former.

not displace the metaphysicians at the outset, and it appears hospitable to doing metaphysics.

6.4 NATURALIZED METAPHYSICS ON THE UNDERDETERMINATION PROBLEM

Naturalized metaphysics hopes to answer some of the same questions that are traditionally raised in metaphysics, but instead of appealing to intuitions, common sense, conceptual analysis, and a priori reasoning, naturalized metaphysics seeks to answer these metaphysical questions using the findings of our current best science. Naturalized metaphysics therefore faces the usual arguments that our best scientific theories cannot justify beliefs about what is real such as versions of the pessimistic meta-induction (Laudan 1981; Stanford 2006). This issue, however, will be set aside here since most proponents of naturalized metaphysics seem to follow Katherine Hawley (2006) when she remarks that “it should come as no surprise that anyone who is skeptical about the ability of science to give us knowledge of quarks and quasars will be sceptical about whether science can give us knowledge of universals and possible worlds” (2006, 454; see also Ney 2012, 64). Naturalized metaphysics recognizes, in this sense, that it would have little appeal to scientific anti-realists and instrumentalists. However, in so far as these are metaphysical anti-realists as well – Bas van Fraassen (2002) being an example – they will already be skeptical of the metaphysical realism shared by both traditional and naturalized metaphysics.

The focus here is instead on a problem relating to deriving a metaphysics from our scientific theories even once it is recognized that it is, in principle, epistemically sound to do. The problem is that metaphysics is generally underdetermined by science or more precisely by the empirically active components of scientific theories (e.g. Andersen and Becker Arenhart 2016; Chakravartty 2017; Dorato 2013; French 1998; 2011; Raley 2005; Robus 2015; Thomasson 2017b).⁸⁵ There are, or so the argument goes, typically several metaphysical accounts that are consistent with the scientific theories and which can, at least in a minimal sense, explain the empirical success of the theory. By ‘metaphysical account’ is meant the kind of account that furnishes the world with elements and relations that can then feature as the foundation for a description of a series of events that capture the empirical findings. A standard

⁸⁵ Earman (1993) questions whether there are in fact that many examples of underdetermination which are not overly artificial. Those who are sympathetic to this line of argument and therefore reject the general underdetermination of metaphysics by science can consider the following an exploration of what role the metaphysician might have had in naturalized metaphysics if such underdetermination were real.

example is the availability of both deterministic – for instance Everett (see, e.g., Vaidman 2014) – and indeterministic – for instance spontaneous collapse (see, e.g., Allori 2021; Gisin 2021) – interpretations of quantum mechanics.

Such underdetermination immediately challenges the promise of naturalized metaphysics to deliver epistemically justified answers to metaphysical questions. In the concrete example, naturalized metaphysics cannot say whether the world is deterministic or indeterministic. This, of course, is no different from the *status quo* of autonomous metaphysics, so one might argue that we are requiring too much of naturalized metaphysics, if we ask it to *settle* such metaphysical debates. The problem with asking anything less of naturalized metaphysics, however, is that this challenges its alleged epistemic superiority over autonomous metaphysics. If naturalized metaphysics only delivers disjunct possibilities, i.e., claims that one among a range of alternatives is true, then naturalized metaphysics provides precisely what we had already. To sustain its superiority, naturalized metaphysics would therefore have to insist that it has better epistemic warrant for such disjunctive claims, say, for the claim that either determinism or indeterminism is true.

Naturalized metaphysics can appeal to the further evidence that the metaphysical alternatives they entertain are the only currently conceived alternatives compatible with science. ‘Currently conceived’ is an important qualification since it signifies that neither naturalized nor autonomous metaphysics can be certain that they have considered all possibilities. Neither party can, in other words, know that their disjunct is exhaustive which would have immediately warranted believing it true. Left is therefore the compatibility with science. In Bayesian terms, we inquire whether we should increase our credence, for instance, in the disjunction ‘either determinism (D) or indeterminism (I)’ when we discover that science is compatible with both alternatives (E). By the probability calculus, this is equivalent to asking whether the probability of this compatibility is larger than otherwise under the assumption that one of the alternatives is true.⁸⁶ However, if the underdetermination of metaphysics by science is assumed to be prevalent, then the prior probability that the metaphysical alternatives are compatible with science is arguably already close to one. Thus, even if it is granted that this probability is higher when one of the alternatives is assumed to be actual, the difference can at most be marginal since the probability is bounded by one. This in turn implies that evidence in the form of compatibility with science can only marginally increases our credence in the disjunction of the metaphysical

⁸⁶ $P(D \vee I|E) = P(D|E) + P(I|E) - P(D \wedge I|E) = P(E|D)/P(E) \cdot P(D) + P(E|I)/P(E) \cdot P(I)$, assuming that the metaphysical alternatives in question, for instance determinism and indeterminism, are mutually exclusive such that $P(D \wedge I|E) = 0$.

alternatives whereby the epistemic superiority of naturalized metaphysics is at best miniscule. Things might be different if the prior probability that science is compatible with the metaphysical alternatives is not close to one. This, however, amounts to begging the question against prevalent underdetermination, let alone that further argument is needed why the probability of compatibility with *both* alternatives should be significantly larger when one of the alternatives is assumed to be true.

Thus, naturalized metaphysics must break the underdetermination of metaphysics by science to secure significant epistemic superiority over autonomous metaphysics, and the literature contains several attempts at this.

- (i) Some argue that there are scientifically sanctioned means with which to overcome this underdetermination (e.g. Hawley 2006).
- (ii) Some recognize that parts, but not all of metaphysics is underdetermined (e.g. Ney 2012).
- (iii) Some reject the underdetermination of metaphysics by science (e.g. French 2011; 2014; Ladyman and Ross 2007).

The first strategy is to break the underdetermination of metaphysics by science with a scientifically sanctioned method of choosing between the alternative metaphysical accounts (option (i)). Hawley, for instance, observes that, when it comes to scientific theories, “the fact that empirical data are compatible with more than one theory does not mean that the data support each theory equally” (2006, 457; see also Morganti 2016, 86–87). Integration with other well-confirmed theories and the quality of the explanation of the empirical data are used for choosing one scientific theory over another despite their empirical equivalence. Based on this, Hawley speculates that also metaphysical theories could be prioritized by such considerations: “Although the empirical data and perhaps some of the lower-level scientific theorising are compatible with more than one metaphysical theory, they may nevertheless give us reason to prefer one metaphysics over another” (2006, 457–58). Thus, the underdetermination of metaphysics by science might be overcome by additional scientifically sanctioned considerations not directly related to empirical adequacy.

The criticism leveled at the type of considerations alluded to by Hawley is, however, that it reintroduces a role for the contested traditional methods of metaphysics (Robus 2015; Andersen and Becker Arenhart 2016).⁸⁷ More precisely, the reasons beyond empirical adequacy that Hawley puts her faith in can only be those of simplicity, coherence, and explanatory power that are also

⁸⁷ Ribeiro (2015) simply accepts this and propose that the underdetermination of metaphysics by science can (and should) be broken using the traditional methods of metaphysic.

the basis for adjudicating between theories in metaphysics. If these are illegitimate in the context of autonomous metaphysics, then this must also be the case when they are used in naturalized metaphysics. With this strategy, therefore, it is difficult to sustain the superiority of naturalized metaphysics over autonomous metaphysics. It is perhaps telling that others use this parallel to *vindicate* autonomous metaphysics, observing that in metaphysics, “just as in science, theories are compared with respect to the elegance, simplicity and explanatory virtues of their models, and theories are chosen over their competitors using inference to the best explanation” (Paul 2012, 12). If these can be legitimately appealed to in science, then this should also be legitimate even in autonomous metaphysics. Ladyman (2012), however, argues that for instance explanatory power might not be as important in science as suggested by these continuity arguments and further, that the role of explanation in science and metaphysics is not similar enough to vindicate metaphysics (see also Huemer (2009) and Saatsi (2017)). For present purposes, the important point is that naturalized metaphysics must drive a wedge between the use of theoretical virtues and inference to the best explanation in science and metaphysics to avoid that all of metaphysics can legitimately use these for theory choice. But in doing so, naturalized metaphysics seems to block Hawley’s strategy of using these to break the underdetermination of metaphysics by science: Why should naturalized metaphysics share in the legitimate use of these methods in science when choosing between metaphysical alternatives rather than their illegitimate use in other metaphysics?⁸⁸ This is, in a sense, a version of the general challenge for to the naturalized metaphysician identified by Ross who observes that “if her [the naturalized metaphysician’s] commitment to naturalism is serious, she needs a principled basis for staying out of non-naturalistic debates, which is complicated if she invites them herself” (2016, 222). Without such a principled argument, as Ross’ remark implies, breaking underdetermination with appeal to theoretical virtues undermine the epistemic legitimacy of naturalized metaphysics. In sum, strategy (i) is either at the risk of reintroducing the illegitimate traditional methods of metaphysics or, if it is argued that they are not illegitimate after all, then this might validate those methods even in autonomous metaphysics.

⁸⁸ A reply could be Chakravartty’s (2017) proposal that, while “metaphysical inference is inescapable” (p. 45) in “scientific ontology”, it comes in different degrees depending on its integration with science, which constitutes a continuum from less to more epistemically risky metaphysical inferences. Consequently, there are – depending on the distance from science – “magnitudes of metaphysical inference that are conducive to knowledge and those that are so large as to suggest a suspension of belief” (Chakravartty 2017, 168). Though this sustains some difference between naturalized and non-naturalized metaphysics, the problem remains whether metaphysical inferences – including the traditional methods of metaphysics – are ever conducive to knowledge even if they are sufficiently scientifically informed.

A more promising way out would be the idea that some metaphysics escapes underdetermination (alternative (ii)). Ney, for instance, argues that while physical theories often admit different interpretations with different metaphysical commitments, there are “representational features that are as a matter of fact indispensable to our best physical theories as they are actually understood” (2012, 60). These indispensable “representational features” include entities, structures, and principles that occur in all “rival formulations of our physical theories” (Ney 2012, 61). Ney offers Lorentz invariance as an example of such an indispensable element on the grounds that physicists agree that any relativistic theory must be Lorentz invariant.⁸⁹ A metaphysical commitment to Lorentz invariance is therefore *not*, according to Ney, underdetermined by science.

However, there are Lorentz violating theories of gravity: for instance Hořava-Lifshitz gravity (Hořava 2009; see Wang 2017 for a recent review). This only testifies that there are physical theories that are Lorentz violating, and Ney (and other proponents of (ii)) might simply concede that also Lorentz invariance is underdetermined by science while insisting that other metaphysics escapes underdetermination. But the existence of Lorentz violating theories at least corroborates the general worry of underdetermination that there is a flexibility in the formulation of scientific theories such that most representational features can be dispensed with. Even the indispensability of numbers (mathematics) has been questioned (e.g. Field 1980) though with disputed success (Malament 1982; Bueno 2003). Thus, the concern remains that all metaphysics is underdetermined by science.

Any attempt to a priori rule out for instance Lorentz violating theories with reference to scientific virtues would threaten to reintroduce a role for the disputed traditional methods of metaphysics and thus render (ii) vulnerable to the worries raised about (i). However, Ney instead proposes to limit the rival formulations entering the indispensability argument by other means: to those that are “endorsed as acceptable alternative formulations by the physics community as a whole” (2012, 63); more on this in section 6.5. It is up to the physics community to decide whether a formulation of physics is to be considered in the indispensability argument. This seems to immediately disqualify Field’s nominalist physics, whereas Hořava-Lifshitz gravity is a borderline case. Still, this strategy of relying on the physics/science community

⁸⁹ One might object that a commitment to Lorentz invariance hardly qualifies as a metaphysical commitment, but this intuition seems to originate in a conception of metaphysics as that which begins where science ends. In so far as both metaphysics and science are in the business of exploring the way the world is, a commitment to Lorentz invariance – though very specific compared to most metaphysical commitments – does relate to what is real which arguably in a central question of metaphysics.

should limit the number of “acceptable alternative formulations” of scientific theories and thus render it more likely that there are shared representational features such that science has metaphysical implications that are not underdetermined.

Finally, there is option (iii) and Steven French’s suggestion that “we should not accept the underdetermination, nor try to break it [...], but undermine it” (2014, 43). In order to convincingly reject or “undermine” the underdetermination problem, the appearance of underdetermination must be explained away. To this effect, proponents of ontic structural realism argue that the appearance of underdetermination originates in a bias for object-oriented ontology (e.g. French 2011). What is real is only the structure shared between the underdetermined metaphysical accounts, and the conflicting object-ontologies of these are merely artifacts of the respective (mathematical) representations used. Once this is realized and an ontic structural realism is adopted, there is no underdetermination of metaphysics by science, or so the argument goes. Notice that only *ontic* structural realism will suffice here. The epistemic variant that merely restricts its metaphysical commitment to the structures while remaining agnostic about the rest of the metaphysics does not, in fact, undermine underdetermination. Rather, it precisely breaks it by arguing that there are features – certain structures – that are not underdetermined, and epistemic structural realism is therefore a version of option (ii) rather than (iii).

Relating to ontic structural realism, French himself raises the question of “how we can be sure there is such a common underlying structure” (2011, 218), which is certainly a central concern for this attempt to undermine underdetermination and therefore for option (iii). By pointing to possible instances of *structural* underdetermination, Holger Lyre (2011) shows that this is indeed a relevant concern. Furthermore, any principled argument that there always is such a common underlying structure would have to limit itself to the scientifically sanctioned resources available to naturalized metaphysics to avoid vindicating, once again, the traditional methods of metaphysics. However, proponents of option (iii) might be able to do without such a principled argument if the cases of structural underdetermination are sufficiently rare (or even non-existing). But even so, the mere availability of epistemic structural realism as a way of interpreting these structural commonalities generates another problem for this attempt to undermine underdetermination.

As naturalized metaphysicians, proponents of (iii) have limited resources with which to show that only the shared structure is representationally significant, i.e., that ontic rather than epistemic structural realism is true. Some scientific theory might of course indicate that an object metaphysics is challenged and therefore suggest the adoption of a structural metaphysics. The quantum

statistics of two entangled spin- $\frac{1}{2}$ particles (electrons) considered by Ladyman and Ross (2007, chap. 3) might well be such as case. These cannot be considered two related individuals but should rather be regarded as one whole. How exactly this cashes out as ontic structural realism is not important here since the point rather is that even assuming the validity of such arguments for *local* ontic structural realism, they are short of establishing the *global* version that only structure is real, always.

This absence of a justification for (global) ontic structural realism is also noticed by Morganti (2011). Morganti identifies two arguments to this effect in the literature: One from the (alleged) preservation of structure across historical theory changes and another arguing that global ontic structural realism is the only metaphysics that avoids underdetermination. Morganti (2011, 1170) analyses both in more detail, but relating to the latter, it suffices for present purposes to observe that this argument for ontic structural realism is simply begging the question. Given that the present concern is whether underdetermination occurs, the argument against this cannot be that ontic structural realism is the only metaphysics where underdetermination does not occur. About the former, Morganti observes that even granting that structure is indeed preserved between theory changes, this cannot differentiate between ontic and epistemic structural realism. Choosing a general view of what is real “on the basis of contingent facts about what got preserved in the history of science may well lead one to ignore important metaphysical elements,” as (Morganti 2011, 1167) argues. Rather, a principled argument for ontic structural realism seems to be needed if this view shall be the basis for rejecting apparent instances of underdetermination. Again, however, naturalized metaphysics does not have the resources to build such a principled argument. An appeal to theoretical virtues, for instance, would reintroduce the worry already raised about option (i). Morganti’s conclusion is therefore apt also for present purposes: “OSR [ontic structural realism] may well be a possible realist position, but it is far from clear that it has been supplied with a compelling justification” (2011, 1175). While one might undermine the underdetermination of metaphysics by science with ontic structural realism, naturalized metaphysics seems to have a hard time justifying ontic structural realism, at least over its epistemic version which, however, amounted to a variant of option (ii) and not (iii).

6.5 THE ROLE FOR THE NATURALIZED METAPHYSICIAN

The underdetermination of metaphysics by science introduces a challenge to the promise of naturalized metaphysics to answer metaphysical questions based on our current best science and without any appeal to the epistemically problematic

traditional methods of metaphysics. By the standards of naturalized metaphysics, the most promising strategy for overcoming the underdetermination of metaphysics by science seemed to be to search for metaphysical questions that are not in fact underdetermined by science, denoted (ii) above. Naturalized metaphysics should look for those representational elements – entities, structures, principles, etc. – that are indispensable to and therefore shared between all the alternative formulations of our scientific theories that are taken seriously by the scientific community. This latter qualification was included to avoid a proliferation of alternative interpretations or “formulations” whose only purpose would be to introduce underdetermination and which would, therefore, likely leave every representational element underdetermined. This qualification is, in other words, crucial for this strategy to successfully deliver answers to metaphysical questions as promised by naturalized metaphysics.

It may seem *ad hoc* to restrict the interpretations considered to those endorsed by the scientific community. Ney, however, finds warrant for this restriction in the general aim of naturalized metaphysics to inherit its legitimacy from the success of the scientific theories it is based on. As Ney argues,

the goal is to get out a metaphysics that has established its semantic and justificatory credentials via physical theory itself, without having to also develop a semantic theory and epistemology for physics. The more we depart from actual physical theories that are accepted by the physics community and conceptions of what is and is not essential to actual physical theories according to the physics community, the more we stray from this goal (Ney 2012, 63).

To preserve the integrity of naturalized metaphysics, it is, as Ney qualifies elsewhere, advisable to consider only those alternative formulations of the scientific theories that partake in the practice that generate the success of science. Unless the scientific community has adopted an alternative formulation, “it is not an alternative formulation of physical theory that has met the standards of acceptance and confirmation of science and so cannot have a bearing on which elements of physical theory are or are not dispensable” (Ney 2012, 63).⁹⁰

⁹⁰ Ney does not provide any details on what grounds the physics community decides whether to endorse an “alternative formulation” or not. However, it seems that the members of the physics community must rely on considerations not directly related to empirical adequacy (as in (i)) or rely on their metaphysical prejudices. The former raises the same worries raised about (i) that these non-empirical considerations are problematic by the standards of naturalized metaphysics. The latter raises the question whether the metaphysical prejudices of physicists

This more restrictive approach to naturalized metaphysics has later been promoted by Ross (2016, 222) as “the Norman approach” reasoning that “[i]f one can do metaphysics this way, then the naturalist’s preferred approach is to restrict herself, as a methodological principle, to doing it only in this way” (Ross 2016, 226). This more restrictive approach to naturalized metaphysics – needed to avoid underdetermination – can thus be motivated as part of the general aim of naturalized metaphysics to minimize the epistemic risk involved in doing metaphysics.

If metaphysicians cannot be trusted to ascertain what counts as a genuine alternative formulation, then the same reasoning arguably applies when determining what features are indispensable between these alternative formulations. Ney (2012, 64–66) here refers to Maddy (1992) who, in the context of the Putnam’s (1979) indispensability argument, argues that scientists do not regard all the (apparent) representational features of their theories as carrying metaphysical significance. Metaphysicians might look at these alternative formulations and posit that a certain metaphysical feature is indispensable to all of them but, Ney warns, “if the physics community does not build such things into its theories and thinks that its explanations are satisfactory as they stand, then we must conclude that such things are not indispensable to current physical theory” (2012, 62). The issue is, as above, that the metaphysicians have no resources with which to overrule science. In terms of the internal coherence of option (ii), it can be added that if the proliferation of metaphysical alternatives is limited to those alternatives that are endorsed by science to avoid underdetermination, then it seems incoherent to argue that metaphysics can subsequently overrule science when deciding what features are indispensable. The dilemma, in other words, is that this restrictive naturalism is needed if there is to be hope that some metaphysical features will not be underdetermined but with it there appears to be no room for doing metaphysics (it will be argued below). Proponents of naturalized metaphysics could of course devise other ways in which to restrict the numbers of alternatives that should be considered for underdetermination. However, Ney’s variant of naturalized metaphysics naturalism with its restriction to those alternative interpretations that are endorsed by the scientific community is currently the only variant of naturalized metaphysics that can deliver on the promise to answer metaphysical questions in the face of underdetermination. Furthermore, it seems likely that other restrictions must be equally radical to succeed.

are any more reliable than those of the metaphysicians. Without an argument to this effect, Ney’s naturalized metaphysics risks becoming a metaphysics of the unexamined metaphysical prejudices of scientists. However, the purpose here is, as announced, not to criticize naturalized metaphysics but to examine what role it leaves for the metaphysician.

So where does this leave the metaphysician in naturalized metaphysics? A metaphysical commitment is justified only in those representational elements that are shared between all the alternative interpretations of our current best science that are endorsed by the scientific community, i.e., those genuinely representational elements that therefore avoids underdetermination. To find these metaphysical commitments, the naturalized metaphysician can begin by surveying the scientific communities for the interpretations they take seriously. Once these are in, the metaphysician can compile a list of representational elements in those interpretations, however, metaphysicians cannot be trusted to decide which of these representational elements that carry metaphysical significance. Instead, the metaphysician must once again turn to the scientific community – possibly with the list in hand – and ask them to underline those elements among all the representational elements that they consider real. Once this data is in, the metaphysician can run the indispensability machinery by investigating whether there are representational elements unanimously regarded as carrying metaphysical significance and if any of them are shared by all the interpretations endorsed by the scientific community. If so, then these can be put on the list of metaphysical commitments. However, this close reliance on the scientific community is for the greater good: to eliminate any contamination of naturalized metaphysics by elements foreign to science such as the pathologies inherent in autonomous metaphysics. Only by restricting metaphysics like this can it be salvaged and become epistemically responsible.

The result of this work is justified claims about reality and metaphysics does therefore preserve its subject matter as promised by naturalized metaphysics. However, section 6.3 argued that there is more to doing metaphysics than being engaged in an activity that delivers the right results. In particular, it was argued that to do metaphysics the metaphysician has to partake in and add to the inquiry about reality in a way that is continuous with typical metaphysical practice. The easy ontologist inference from the existence of a red dress to the existence of properties was given as an example where the metaphysician/ontologist cannot be said to do metaphysics despite the result being an alleged metaphysical truth. An analogous worry appears to apply to the restrictive naturalized metaphysics required to avoid underdetermination. In the generation of justified claims about reality, the task of the metaphysician is reduced to polling the opinions in the scientific community, everything else is relegated to the scientists. While it is the metaphysician that eventually compiles the list of metaphysical commitments, this hardly qualifies as partaking in or adding to inquiry. It is more similar to Hofweber's example of washing the test tubes and the later example of copying down the reading of the scientific instruments. While these tasks are important, in fact essential, to generating the

scientific results, they are not part of the inquiry into reality, and the same goes for polling scientists' opinions.

Furthermore, none of what the metaphysician does in this restrictive version of naturalized metaphysics resembles anything of what Bennett listed as typical activities for metaphysicians. To the contrary, the metaphysician is actively restricted from looking for contradictions, finding counterexamples, teasing out consequences, and developing thought experiments. All, of course, with the well-meaning purpose of making sure that naturalized metaphysics maximizes its epistemic legitimacy by inheriting it directly from science. This ensures that naturalized metaphysics can succeed with generating justified claims about ultimate reality even in the face of underdetermination (assuming that science can justify such claims in the first place), but it is at the expense of the metaphysicians who can no longer practice their trade.

6.6 RE-EMPLOYING THE METAPHYSICIAN

Ladyman and Ross do propose a re-employment program for metaphysicians who, they argue, should focus their attention on "how the separately developed and justified pieces of science (at a given time) can be fitted together to compose a unified world-view" (2007, 45). They explicate this through "the principle of naturalistic closure":⁹¹

Any new metaphysical claim that is to be taken seriously at time t should be motivated by, and only by, the service it would perform, if true, in showing how two or more specific scientific hypotheses, at least one of which is drawn from fundamental physics, jointly explain more than the sum of what is explained by the two hypotheses taken separately (Ladyman and Ross 2007, 36).

Only this unification program is, in fact, a legitimate form of metaphysics. However, the question for present purposes is again whether this re-employment of metaphysicians allows them to do metaphysics.

Ladyman and Ross (2007, 130) explain that their defense of ontic structural realism is in accordance with the principle of naturalistic closure. As the principle requires, ontic structural realism is motivated by two different scientific hypotheses, general relativity and quantum theory, both of them belonging to

⁹¹ Notice that Maclaurin and Dyke argue "that the PNC [principle of naturalistic closure] is too strong a principle to distil from L&R's [Ladyman and Ross'] epistemic concerns" (2012, 299).

fundamental physics (Ladyman and Ross 2007, chap. 3).⁹² If this is indeed exemplar of metaphysics under the principle of naturalistic closure, then it may look promising for the metaphysicians. Developing this view based on the scientific theories seem, from Ladyman and Ross' discussion, to require many of the skills typically employed in metaphysics, most prominently teasing out consequences of scientific theories and finding hidden contradictions in the metaphysical alternatives (apparently combined with inference to the best explanation). Likewise, the subject matter of metaphysics appears to be preserved. This is perhaps most clearly indicated by the fact that the question whether ontic structural realism is true, i.e., whether only structures are real, is at least rendered very differently, or perhaps even outright meaningless, if metaphysical realism is false. If there is "no point of view," as Haukioja puts it above, "from which we [can] compare our theories and belief about the world to the world itself," then it is rather unclear what a defense of ontic structural realism establishes. Thus, Ladyman and Ross appear to be doing metaphysics and the principle of naturalistic closure therefore seems hospitable to this activity.

The problem is that the principle of naturalistic closure, interpreted like this, merely takes the form of an additional robustness requirement for the naturalized metaphysics discussed in the preceding sections. A metaphysical claim is epistemically justified if it is derived from "two or more specific scientific hypotheses" rather than from only one such piece. Is there, however, any reason to suppose that these more robust metaphysical claims will avoid underdetermination? Section 6.4 already noted that ontic structural realism itself might be underdetermined. Thus, the robustness coming from adherence to the principle of naturalistic closure is no guarantee against underdetermination. Furthermore, this principle introduces several complications relating to underdetermination. Consider the underdetermined alternatives of determinism and indeterminism in quantum mechanics. Neither are based on based on more pieces of science, but both could be so. The determinists could appeal to general relativity, but the indeterminists could likewise appeal to arguments that there is inherent indeterminism in the theory of evolution (Brandon and Carson 1996; Glymour 2001).⁹³ Both metaphysical

⁹² How ontic structural realism "explain more than the sum of what is explained by the two hypotheses taken separately" is mostly left implicit in Ladyman and Ross' account, and this aspect of the principle of naturalistic closure will not be discussed further here either (see, however, Melnyk 2013, 89–90). It seems in any case doubtful that there are resources in this additional requirement to change the picture outlined here.

⁹³ Notice that this proposal is disputed and likely underdetermined itself (see, e.g., Graves, Horan, and Rosenberg 1999; Shanahan 2003).

claims would thus abide by the principle of naturalistic closure (under this interpretation of it) while nevertheless being underdetermined.

Perhaps, however, the principle of naturalistic closure could be interpreted in a way that is more resistant to underdetermination problems. When it tasks metaphysics with the unification of two or more scientific hypotheses, this might merely involve showing that the hypotheses are compatible and not contradictory. An example of this would be the apparent conflict between the need in the theory of evolution of random mutations and the determinism of the general theory of relativity. The former is a specific scientific hypothesis and the latter is a hypothesis/theory of fundamental physics, in accordance with the principle of naturalistic closure. Following the task laid out by the modest interpretation of the principle, the metaphysician could, for instance, point out that what appears to be random mutations for a local observer could (partly) be accounted for by cosmic radiation which, however, from a global perspective could be entirely deterministic. As such, the metaphysician has contributed to “a unified world-view” by resolving this apparent conflict while avoiding underdetermination since the compatibility follows from the availability of this account and not from its uniqueness.

Since this does not appear to be Ladyman and Ross’ intended interpretation of the principle of naturalistic closure, only a brief remark will be made here on whether this more modest unification program qualifies as doing metaphysics. The issue is its dependence on metaphysical realism. If the hypotheses in question are empirically contradictory, then even (semantic) instrumentalists would find their reconciliation important. In this case, we do not have to assume metaphysical realism – indeed, instrumentalists reject this view – for this reconciliation to be meaningful and following section 6.3, the subject matter of this work – and thus the associated activity – is therefore not metaphysics. The modest unification program exemplified by the case above, however, does not involve such direct empirical contradictions but only a more general incoherence. Stathis Psillos (1999, 36–37), following Duhem, has proposed that only realism with its aim at truth can explain why we should be interested in such general incoherence. Margaret Morrison, however, suggests – in the context of the theory conjunction problem (see, e.g., Friedman 1983; Putnam 1973) – that unification is a rational pursuit also for instrumentalists because it is “crucial in the search for theories that are equipped to explain and predict a variety of phenomena” (Morrison 1990; see Hendry 2001 for a reply). Furthermore, unification has been argued to be a rational concern for instrumentalists since unified theories are more likely to be empirically adequate (Forster and Sober 1994; Myrvold 2003). By these arguments, the general coherence of hypotheses is important to instrumentalists as well as realists, an attitude impersonated, for

instance, by Arthur Fine (1986; 2018) who explicitly rejects metaphysical realism. This at least indicates that establishing the compatibility of hypotheses – as the metaphysicians are tasked to do by the modest interpretation of the principle of naturalistic closure – does not qualify as doing metaphysics by the standards of section 6.3 since this activity does not depend on metaphysical realism.

6.7 CONCLUSION

Naturalized metaphysics aims to establish justified metaphysical claims, where metaphysics is meant to carry its usual significance, while avoiding the traditional methods of metaphysics – a priori reasoning, conceptual analysis, intuitions, and common sense – which naturalized metaphysics argues are not epistemically probative. While naturalized metaphysics is, at the outset, hospitable to metaphysicians doing metaphysics, the underdetermination of metaphysics by science changes the picture. This paper has argued that naturalized metaphysics must limit its metaphysical commitments to those entities, structures, and principles that are not underdetermined and, for there to be any, restrict the underdetermined alternatives under consideration to those that are taken seriously by the scientific community. Otherwise, underdetermination variously leads naturalized metaphysics to use the traditional methods of metaphysics and therefore into incoherence.

This way of breaking underdetermination, however, leaves the metaphysician behind. The task of the metaphysician is merely to survey the opinion of the scientists and compile a list of metaphysical commitments from those features that all the scientists regard as indispensable for our best science. But this hardly qualifies as doing metaphysics. Thus, even though Ladyman and Ross insist that we cannot “go back to anti-metaphysical positivism” and argue that theirs is “an exercise in metaphysics” (2007, 26), naturalized metaphysics ultimately has to align itself with logical positivism and the eliminative trends of contemporary metametaphysics. As Robert Kraut writes of one interpretation of Carnap’s philosophy: “Carnap’s goal, according to this prevalent picture, is to discredit ontology: to encourage us to stop doing it” (2016, 31). In a sense, naturalized metaphysics ultimately achieves precisely this. While naturalized metaphysics still alleges to deliverer justified claims about ultimate reality, the latter likely being to Carnap’s dismay, metaphysicians can neither partake in nor add to this inquiry because it risks inviting the epistemically problematic autonomous metaphysics back in. Thus, whether Carnap’s deflationism or naturalized metaphysics is vindicated, the metaphysicians are nonetheless displaced.

7 NATURALIZED METAPHYSICS AND NON-FUNDAMENTAL METAPHYSICS

This chapter continues the exploration of the prospects of naturalized metaphysics, this time focusing on its role in and relevance for non-fundamental metaphysics. As this chapter observes, naturalized metaphysics, especially with its general emphasis on physics, is at the outset an archetypical fundamentality-focused metaphysics. It is a metaphysics whose primary concern is the fundamental content and structure of the world. This attitude is, for instance, reflected when Ladyman and Ross describe themselves as being “interested in objective truth rather than philosophical anthropology (Ladyman and Ross 2007, 5). Social ontology or more generally, non-fundamental metaphysics is not the concern for naturalized metaphysics, though social science may perhaps have some relevance for these domains (Hawley 2018). This chapter, however, considers whether this attitude is warranted and, if it is, why. After all, a central point already for Sellars is that there is only one world, that revealed by science, and all belong to this world. Though without mentioning Sellars, this view is nicely summarized by Ladyman in a characterization of his scientism when he insists that “we ourselves and our cultures and societies are part of nature” (Ladyman 2018, 113). On these grounds, it seems *prima facie* surprising that metaphysics should divide into mutually independent domains. Taking an example from Sabine Hossenfelder, our bones are responsible for keeping us upright, and these bones are made of calcium atoms which typically comprise of 20 electrons, 20 neutrons, and 20 protons (where the latter two are in turn composed of quarks). However, we do not have to know this to keep ourselves upright: “much of the information from the smaller things, it turns out, isn’t relevant to understanding the larger things” (Hossenfelder 2018, 44). “Intuitively you have known this all your life [...],” as Hossenfelder notes in relation to the bone example and continues: “But conceptually this lack of influence is absolutely astonishing. Given the enormous number of individual constituents, why doesn’t all this atomic substructure lead to behavior that’s exceedingly difficult to pin down?” (Hossenfelder 2018, 42). Taking this argument to a metaphysical context, we might likewise say that it is conceptually astounding if fundamental and non-fundamental metaphysics turns out to be entirely independent. Thus, we should not consider a claim to the contrary to be ridiculous, though the evidence – as Hossenfelder’s example also indicates – appears to be against it.

This chapter offers such an argument that fundamental metaphysics – naturalized metaphysics in particular – and non-fundamental metaphysics are mutually dependent and that they should perhaps feed into each other. This

argument is developed in dialogue with the work of Karen Barad which brings together elements of quantum metaphysics and critical theory into the framework of agential realism. The argument is rather speculative, and several criticisms are offered along the way. For present purposes, however, the aim is not to assess whether Barad's framework is correct or not but rather to suggest that she offers a refreshing way of thinking of the relation between naturalized metaphysics and non-fundamental metaphysics. If the world is one, as naturalized metaphysics and Sellars claim, then insights about one aspect of the world should *prima facie* have the potential to be relevant for our theorizing about its other aspects.

The setup of this discussion, however, is complicated since Ladyman and Ross, in the context of science in particular, are rather critical of usual renderings of fundamentality. "What we aim to do in this book is displace the micro/macro distinction, whether conceived in terms of wholes and parts or in terms of higher and lower levels, by a new way of drawing the distinction between fundamental physics and special sciences" (Ladyman and Ross 2007, 57). Clearly, without resorting to higher and lower levels or part/whole structures, explicating the difference between fundamental and non-fundamental metaphysics becomes complicated. Since this chapter shall eventually question whether such a distinction can in fact be sustained, this conclusion might be welcome. Ladyman and Ross, however, are not advocating that there is no fundamental/non-fundamental distinction, only that it must be rendered differently, writing "by 'fundamental' physics we will refer to that part of physics about which measurements taken anywhere in the universe carry information" (Ladyman and Ross 2007, 55). This part of physics is, in other words, fundamental because Ladyman and Ross by 'fundamentality' understand a kind of description that applies everywhere and not only locally in some designated domain. Though this explication concerns "fundamental physics," they remark elsewhere that "[m]etaphysics, as the project of unifying the scientific world-view, shares the maximum scope of fundamental physics" (Ladyman and Ross 2007, 37). On Ladyman and Ross' construal, Metaphysics, or at least fundamental metaphysics, shares this understanding of fundamentality. Fundamental metaphysics, which in Ladyman and Ross' view is coextensive with naturalized metaphysics, is by this understanding not describing any bottom level of reality but rather those features that we find everywhere in space and time. On this view, the difference between fundamental physics and the special sciences, which comprise all the rest of science, is that the domain of fundamental physics is unbounded whereas those of the special sciences are limited to particular domains. This provides for an associated difference between fundamental and non-fundamental metaphysics.

This understanding of fundamentality immediately appears to be at odds with the discussion in this chapter of different levels of description which is closer to the part/whole or micro/macro understanding of fundamentality that Ladyman and Ross reject. Another important difference is that levels of description support many layers of relative fundamentality (atoms more fundamental than bones, elementary particles more fundamental than atoms, etc.). On Ladyman and Ross understanding, however, fundamentality is a dichotomy. Those descriptions that pertain to all of reality are fundamental while those that are limited to a domain are not. This understanding does not immediately support an understanding of relative fundamentality among the non-fundamental descriptions. Ladyman and Ross do not consider this issue, and one can also avoid it following an understanding of the discussion of this chapter as concerning solely the relation between the fundamental (in the form of quantum metaphysics⁹⁴) and the non-fundamental (in the form of social theorizing), thus setting aside how different non-fundamental accounts should relate. This still leaves the inadequacy of the “levels of description”-talk. However, it might be compatible with Ladyman and Ross’ understanding of fundamentality if ‘lower/micro level of description’ is understood as concerned with the fundamental and ‘higher/macro level of description’ is understood as concerned with the non-fundamental.

With these terminological tensions out of the way, we can see that Ladyman and Ross’ rendering of fundamentality might indeed be particularly hospitable to the proposal here that there could be interdependence between fundamental and non-fundamental metaphysics. If the fundamental is informed by, and thus carries information about, measurements everywhere in space and time, then any theory established by such measurements should be affected by, but also relevant to, the fundamental description. This should be so irrespective of what the domain of this theory is, i.e., irrespective of what we usually explicate at the scale being described. Ladyman and Ross seem to recognize such impact of the fundamental on the non-fundamental in this remark about Newtonian and quantum physics:

Refusal to take seriously the implications of living in a world that has turned out not to be Newtonian is also exemplified when philosophers imagine that the strange features of quantum physics can be contained. So it is often claimed that although quantum mechanics seems to imply indeterminism and single-case probabilities, these can be confined to the

⁹⁴ Quantum mechanics is arguably not our most fundamental theory of the world and using it to inform our *fundamental* metaphysics might therefore be a mistake. This issue, however, will be set aside here.

microscopic level. Plainly, however, if there is indeterminism among quantum events and there is any coupling of them to macroscopic events, as there surely is, then the indeterminism will infect the macroscopic (Ladyman and Ross 2007, 25).⁹⁵

The metaphysics of quantum physics – exemplified by indeterminism – is not contained in the microworld but, since there is only one reality, must permeate all of it. In a sense, this is also what Barad argues but she arguably finds the consequences of quantum metaphysics to be more wide-ranging than Ladyman and Ross. This, however, only concerns how the fundamental informs the non-fundamental. If every measurement carries information about the fundamental description, then insights about non-fundamental reality also based on measurements (broadly construed) should be relevant to the fundamental description as well. This generates the independence between the fundamental and non-fundamental metaphysics that this chapter explores.

The remainder of the chapter is, apart from a few changes, identical to an article forthcoming in *Hypatia* with the title “Naturalized, fundamental, and feminist metaphysics all at once: The case of Barad’s agential realism.”

Naturalized, fundamental, and feminist metaphysics all at once: The case of Barad’s agential realism

In contemporary mainstream metaphysics, typical explications of metaphysics involve a description of the subject matter as the “systematic study of the most fundamental structure of reality” (Lowe 1998, 2) or “the study of ultimate reality” (van Inwagen 2015, 1). Following such explications, mainstream metaphysics tends to focus on those entities and structures that ground everything else. These most fundamental elements of reality take priority in metaphysical investigations. However, metaphysicians focusing on fundamentality, Elizabeth Barnes finds, “have made the discipline increasingly hostile to the prospect of feminist metaphysics” (2014, 347–48) whose interest is themes such as gender and social structure that are typically not regarded as investigations into ultimate reality (Barnes 2014, 340).

⁹⁵ As this quote shows, Ladyman and Ross also use the level metaphor despite their rejection of it.

While the works of Sider (2011) and Schaffer (2009) serve as Barnes' primary examples of fundamentality-focused metaphysics, naturalized metaphysics – another prominent recent trend in analytic metaphysics – arguably falls in the same category. Naturalized metaphysics argues that metaphysics is only (epistemically) credible if it is inspired and constrained by the findings of our best science, physics in particular as signified by Ladyman and Ross' "Primacy of Physics Constraint" (2007, 38). In prioritizing physics (rather than for instance sociology), naturalized metaphysics sides with the mainstream metaphysics following Mikkola's notion "that a major difference between feminist and 'mainstream' metaphysics pertains to our choice of what level of 'reality' we should ontologically privilege" (2017, 2445). While feminist metaphysics privileges the entities of our lifeworld, mainstream metaphysics including naturalized metaphysics finds these to be merely derivative from and supervenient on the microscopic entities of the metaphysically more important fundamental level of reality.

Ladyman and Ross (2007, 5) explicitly draw a division similar to Mikkola's when they insist that their naturalized metaphysics is independent from philosophical anthropology that studies the world as constituted by our situated, human practices. Describing naturalized metaphysics as interested in objective truth rather than philosophical anthropology, Ladyman and Ross not only promote the priority of a fundamentality-focused metaphysics over inquiries into other (derivative) aspects of reality, but also contribute to the hostility towards feminist metaphysics. Mikkola (2015), in contrast, argues that there is much to gain from recognizing the importance of what one might characterize as the metaphysical branch of philosophical anthropology. Common, however, to both Mikkola and Ladyman and Ross is a commitment to some principled distinction between these two types of inquiry, and their disagreement concerns which, if any, takes priority.

With an apparently principled distinction between fundamentality-focused metaphysics and philosophical anthropology including feminist metaphysics, attempts to reconcile the two has followed the pattern of recommending a more permissive attitude towards metaphysics than that characteristic of mainstream metaphysics. This approach is exemplified by Mikkola (2015), Bennett (2016), Sider (2017), Schaffer (2017), Hawley (2018), and Passinsky (2019), all of which (though in various ways) find it appropriate for metaphysics to include both types of investigations. This paper, however, will investigate a different approach whereby mainstream and feminist metaphysics are reconciled by denying the existence of the type of division suggested by Mikkola, Barnes, and Ladyman and Ross.

The investigation takes the form of an exploration of the work of Karen Barad who engages seriously with issues of philosophical anthropology broadly construed and feminist metaphysics in particular while sharing the characterizing features of naturalized metaphysics. Barad's metaphysical⁹⁶ framework – known as “agential realism” – is based on quantum mechanics and proclaims its validity by this origin. However, agential realism has – on Barad's own initiative⁹⁷ – been very influential in social theory broadly construed, especially in queer theory, feminist new materialism, and posthumanism. As de Freitas writes: “She shows how quantum physics can inform our thinking about gender, racial, queer and other differences” (2016, 150). While these issues have a significant overlap with feminist metaphysics, they are notably absent from naturalized and other fundamentality-focused metaphysics. Thus, to the extent that agential realism succeeds as a quantum mechanics-based metaphysics, it challenges the claimed independence between naturalized metaphysics and philosophical anthropology and thereby offers a radical resolution to the tension between mainstream and feminist metaphysics. Rather than simply broadening the scope of metaphysics to include both fundamental and non-fundamental metaphysics, Barad can be seen as arguing that fundamental metaphysics – more particularly, the metaphysical consequences of quantum mechanics – connects with the themes otherwise covered by feminist metaphysics.

Feminist scholars are, of course, not strangers to physics in general and quantum mechanics more particularly. Evelyn Fox Keller (1995), Helen Longino (1990), Barbara L. Whitten (1996), among many others have all variously discussed aspects of the meeting between quantum mechanics and feminism. However, in the taxonomy of Helene Göttschel (developed specifically for the entanglements of gender and physics), these works focus on “Human actors in physics”, “Work place cultures in physics”, and “Knowledge production in physics” (Göttschel 2011, 67). These issues of sociology and epistemology of science have likewise been the focal points in the broader field of feminist philosophy of science (see, e.g., Crasnow (2013), Nelson (2002), Richardson (2010), and Wylie (2012) for reviews of this vast field of research). In comparison, Göttschel argues that Barad's work – though also concerned with these other aspects – stands out when it sees “the inclusion of approaches coming from physics into the development of new theoretical and methodological concepts” (Göttschel 2011, 67). Arguably also Haraway's (1992) concept of diffraction comes “from physics,” but Barad's use of physics is importantly different since quantum mechanics

⁹⁶ Ethic-epistem-ontological framework in Barad's own terms (2007, 90).

⁹⁷ The broad intended scope of agential realism is for instance exemplified when Barad argues how agential realism is “of interest to researchers in the fields of critical social theory, social and political philosophy, feminist theory, queer theory, political economy, physics, philosophy of physics, ethics, epistemology, science studies, and others” (2007, 69–70).

serves as (part of) the *motivation and justification* of the feminist content of agential realism, as discussed in more detail below. In contrast with Haraway, Barad is explicitly *not* using physics as a metaphor or analogy. Instead, Barad's agential realism is fundamental, naturalized, and feminist metaphysics all at once. On Barad's construal, therefore, there is no antagonism between these since feminist metaphysics is fundamental and fundamental metaphysics is feminist. This is Barad's novel move in the debate and therefore the focus here. Barad may, in this light, be seen as proposing a metaphysical analogue of Nelson's (1995) reconciliation of feminist and mainstream epistemology.

Though the focus of the present discussion is, as such, on Götschel's last aspect, it cannot, of course, be entirely insulated from the numerous other contributions to the understanding of the physics practice, including the production of "quantum mechanics." Unfortunately, it is beyond the scope here to explore any further how these perspectives fold into each other, and this may therefore merely be considered an invitation for future investigations into the interplay between these varied feminist approaches to the scientific practice, and how they may inform the conception and scope of (naturalized) metaphysics. Only the issue of the authority and objectivity of science, raised so often in both feminism and science studies, shall briefly be remarked upon (see, e.g., Haraway 1988; Harding 1986; 1991; Longino 1990; Nelson 1990). In the context of Barad's work, Trevor Pinch puts this issue as follows: "I find it deeply puzzling that Barad can call for a more situated account of science and at the same time fail to situate the very part of science she is talking about, while drawing in a realist mode upon experiments to support her position" (2011, 439; see also Willey 2016). The issue, in brief, is how to negotiate the role of quantum mechanics as both source and subject for agential realism. Barad invokes complementarity (more on this notion below) and its entailed simultaneous "mutual exclusivity and mutual necessity" (Barad 2011, 444) as a reply. This invites a diffractive methodology that reads quantum mechanics as source and subject through one another. As Barad qualifies, "agential realism offers a possibility for thinking 'the social' and 'the natural' together in a way that is responsive and responsible to the world" (Barad 2011, 447) including being "vulnerable to empirical results" (Barad 2011, 446; see also 2012b, 45–46). It is "experimental meta/physics," as Barad (2014, 180) writes elsewhere. Whether Barad's reply to Pinch is satisfactory cannot be decided here (see, e.g., Ginev (2016) and Hollin et al. (2017) for further discussion). Instead, it will merely be noted that Pinch's worries are equally relevant for the present rethinking of the relation between feminist and fundamental metaphysics based on Barad's work.

Barad's reply to Pinch is indicative of the naturalized character of agential realism (more on this in section 7.3). Like other naturalized metaphysics, Barad

intends agential realism to be responsive to the findings of science and quantum mechanics more particularly, though science should, as qualified, also be responsive to agential realism. However, in contrast with other naturalized metaphysics, agential realism also aims to enter the domain of feminist metaphysics and feminism more generally. Extending the scope like this of a quantum mechanics-based naturalized metaphysics raises the immediate questions of how and why the details of quantum mechanics can remain relevant for social theorizing given that the lifeworld appears to be largely insulated from the peculiarities of the quantum world. Barad is never quite clear on this central issue and an important aim of this paper is therefore to piece together her argument. In brief, Barad's argument seems to rely on the proposal that some features in a metaphysics might not admit approximation. Assuming, as Barad does, that the world is not broken into separate domains, features that do not admit approximation must have the same ontological status at all levels of description. They must either be there or not there from the perspective of fundamental and non-fundamental metaphysics alike. For instance, if an ontological separation between a subject and the object it studies is impossible to sustain in quantum mechanics, then how could this "dualism," as Barad calls it, suddenly emerge as we move from the quantum world to our lifeworld?⁹⁸ This dualism is either there or not there and in being absent at the quantum level of description, it can therefore not feature in our theorizing about our lifeworld either. In other words, this (alleged) impossibility of metaphysical approximation is why the implications of quantum metaphysics be relevant to philosophical anthropology in general and feminist metaphysics in particular.

The present paper also informs a theme more closely related to Barad and those using agential realism. This includes how agential realism is meant to be grounded in and justified by quantum mechanics where the paper resists, as already indicated above, a reading of the role of quantum mechanics in Barad's work as that of analogy and also resists a conception of agential realism as a metaphysical template that "is *deployed* across a range of scales" (Hollin et al. 2017, 25, emphasis added). Instead, the textual evidence supports an understanding where agential realism is only deployed once, to reality as a whole, and rather has a scope – due to the character of its metaphysical implications – that extends from fundamental physics all the way to macroscopic contexts. Observe in this regard that the paper is *not* meant as an assessment of the legitimacy of agential realism as an interpretation of quantum mechanics.

⁹⁸ Arguably, this and the other dualisms that Barad discusses are most commonly cast as epistemological rather than ontological dichotomies. However, the agentiality of composition and the materiality of meaning in agential realism (partially) collapses the distinction between ontology and epistemology or at least renders epistemological categories more sensitive to ontology (Hollin et al. 2017, 933).

Instead, the paper largely assumes the agential realist account of quantum mechanics and rather focuses on what warrants the role of this naturalized metaphysics in philosophical anthropology, i.e., how Barad argues that agential realism is relevant for theorizing about the lifeworld and thus how agential realism integrates fundamental and non-fundamental metaphysics. The primary concern here is, as such, metaphysical methodology and, more particularly, to use Barad's work – which has otherwise not been considered in this context – as an inspiration for how to reconcile fundamentality-focused mainstream metaphysics with feminist metaphysics. Barad's contributions to these fields will therefore only feature here to the extent that they illustrate this methodological point, and the same goes for discussions of other first-order content.

The paper proceeds as follows: Section 7.1 will briefly introduce agential realism with an emphasis on its relation to Niels Bohr's interpretation of quantum mechanics. Section 7.2 introduces the distinction between philosophical anthropology and naturalized metaphysics (as it is discussed in naturalized metaphysics), its relation to the division between mainstream and feminist metaphysics, and argue that agential realism exemplifies both philosophical anthropology and feminist metaphysics more particularly. Section 7.3 then proposes that agential realism can be regarded as a naturalized metaphysics, but one that intends to be relevant also for philosophical anthropology. Section 7.4 goes on to discuss how agential realism means to achieve this very broad intended scope before section 7.5 concludes with a discussion of the implications of Barad's argument for feminist metaphysics and its relation to fundamentality-focused metaphysics.

The paper concludes that agential realism aspires to remove the division between fundamental and non-fundamental metaphysics. Fundamental and feminist metaphysics must be approached diffractively by reading them through each other. The success of this radical resolution of the tension between mainstream and feminist metaphysics depends crucially on the idea that some features in ontology do not admit metaphysical approximation. These will therefore have to have the same ontological status across all levels of description. Whether there are such features remains, in my view, an open question. However, even in their absence, the discussion exposes that it is at most contingent that one can pursue philosophical anthropology including feminist metaphysics and fundamentality-focused metaphysics of physics independently of each other. If at all, the events of our lifeworld just happen to be autonomous enough from the details of fundamental metaphysics to be practically independent for purposes of social theorizing, and the same *contingent* autonomy entails that our understanding of the lifeworld cannot serve as evidence for the fundamental metaphysics.

Before proceeding, two terminological remarks are in order relating to, first, micro and macro levels and, second, to the term ‘theory’. Both Barad (2007, 24), Barnes (2014, 336), Mikkola (2017, 2445), and myself speak variously in terms of a micro/macro distinction. This is to mark a difference in the typical length scale between the micro (small length) level of description associated with quantum mechanics – involving particles and fields – and the macro (long length) level associated with our lifeworld. This divide is therefore very different from when, for instance, Nick Fox and Pam Alldred call for a new materialist social inquiry that is sensitive to both “the micro/macro scales of social production” (Fox and Alldred 2015, 408). While they distinguish “‘micro’ (e.g. a consumer transaction) and a ‘macro’ relation (e.g. a nation-state)” (Fox and Alldred 2015, 402), both are considered macro in the present context. This terminology, however, is not meant to carry any commitment to the relative importance of these levels of description. Indeed, Barad, as indicated above, emphasizes their “mutual necessity.” Neither is it meant to suggest a difference in detail, care, and responsibility between studies conducted at different levels.

On several occasions, quantum mechanics will be referred to as a theory (e.g. Barad 2007, 85; Harrell 2016, 27). This, however, should not be considered an attempt to abstract away experiments and the scientific practice, as Longino (1987), for instance, has warned against. Indeed, Barad (2007, chap. 7) is very mindful of the experimental practice associated with quantum mechanics, as Ginev remarks, agential realism is very much an “ontology of knowing-within-practices” (2016, 69). For this reason, I will below simply refer to quantum mechanics with the understanding that this body is enacted through experimental-social-theoretical intra-actions.

7.1 AGENTIAL REALISM

Giving a full account of Barad’s agential realism with all its subtleties is well beyond the scope of this paper.⁹⁹ However, some of its central aspects concern the relation among entities, the ascription of properties, and the interplay of entities being studied and those studying them for instance in performing a measurement. Based on arguments coming out of quantum mechanics, agential realism involves, in Barad’s own words, the “disruption of the metaphysics of individualism that holds that there are discrete objects with inherent

⁹⁹ The interested reader is advised to consult Barad’s own writings on the subject; especially her magnum opus *Meeting the Universe Halfway* (2007). Those interested in an exposition of agential realism as a feminist philosophy of physics can consult Harrell (2016, section 2.3.3). Agential realism in the broader context of feminist philosophy of science and its “moving between naturalized descriptions of science and constructive reformulations of scientific norms” is further discussed by Richardson (2010, 349). Finally, agential realism and its relation to naturalism in general is explored by Rouse (2004).

characteristics” (Barad 2007, 422), which, given a special emphasis on Bohr’s interpretation of quantum mechanics,¹⁰⁰ “calls into question the dualisms of object-subject, knower-known, nature-culture, and word-world” (Barad 2007, 147)¹⁰¹ and requires a rethinking of “the notions of matter, discourse, causality, agency, power, identity, embodiment, objectivity, space, and time” (Barad 2007, 26).¹⁰² For present purposes, the focus will be on the metaphysics of individualism, the dualisms of subject-object and word-world, and the notion of agency, and how these, according to Barad, are effected by quantum mechanics. The next section will then indicate how these connect to themes typically covered by feminist metaphysics such that they together can testify to the quantum origin *and* the very broad intended scope of agential realism.

In positive terms, agential realism is a type of radical relational holism whereby objects emerge from the whole, what Barad (e.g. 2003, 815) denotes ‘phenomena’ (more on this notion below). This whole admits multiple separations into configurations of objects that have properties only relative to the whole. This is what leads Barad (e.g. 2007, 195) to the rejection of the metaphysics of individualism. The argument to this effect goes via the existence in quantum mechanics of complementary properties, an argument that will be recounted in some detail below, whereas the entailed rejections of the mentioned dualisms and how agency enters the picture will be treated more briefly afterwards.

In quantum mechanics, certain pairs of properties are mutually incompatible in the sense that the state of a quantum system, for instance the state of a particle, cannot be ascribed a definite value of both properties. This is signified by Heisenberg’s indeterminacy principle,¹⁰³ which – in its perhaps most common

¹⁰⁰ It is worth noting that Barad bases agential realism on Bohr’s interpretation of quantum mechanics. Barad thereby takes a significant interpretive stand with respect to quantum mechanics and thus its metaphysical implications. Arguably, a similar project based on the many-worlds, spontaneous collapse (GRW), or a Bohmian interpretation of quantum mechanics would yield rather different results. However, this issue is immanent in any quantum mechanics-based naturalized metaphysics and it will therefore not be discussed further here (see Ney (2012) for a discussion of how it may be resolved).

¹⁰¹ More recently, Barad (2012a; 2015) has questioned the being/non-being dualism based on quantum field theory, but the focus here will be on quantum mechanics and these perspectives will therefore not be discussed any further.

¹⁰² The meeting of naturalized metaphysics and philosophical anthropology is already evident here. While the notions of causality, space, and time are common themes in the naturalized metaphysics literature, especially discourse, agency, embodiment, and power are rarely if ever treated in naturalized metaphysics but are rather typical themes of philosophical anthropology and feminist metaphysics in particular.

¹⁰³ I use ‘indeterminacy principle’ instead of the more common ‘uncertainty principle’ since this signifies that this relation between pairs of complementary properties are not expressions

form – expresses the reciprocal relation between the indeterminacy of position and the indeterminacy of momentum. Thus, a definite position entails completely indeterminate momentum and *vice versa*. This does not entail that one can find in experiments a quantum particle that is for instance smeared out in space, i.e., measure the indeterminacy of position. Instead, the system will upon measurement be found in a state with a definite value of the property being measured. Doing a series of interchanging measurements of mutually incompatible properties, for instance measuring position then momentum and then position again, one will, however, not find a correlation between the measurements of the same property since the in-between measurement of momentum reinstalls a complete indeterminacy of position. In this sense, not only the properties but also the experiments measuring the properties are mutually exclusive. This leads to Bohr to the notion of complementarity: “that the attribution of certain properties to quantum objects can take place only in experimental contexts which are mutually incompatible” (Zinkernagel 2016, 10). Bohr, in this sense, integrates concepts such as ‘position’, the property that the concept refers to, and the context measurement. Bohr goes as far as to contend that properties entering in complementary pairs are only meaningful relative to an experimental setup that measures the property in question. As such, the conditions for the ascription of such properties in quantum mechanics depend both on the quantum object of interest *and* an experimental setup: “the ascription of [complementary] properties to the object as it exists independently of a specific experimental interaction is ill-defined” (Faye 2019). Furthermore, the mutual exclusion of complementary pairs entails that the measurement of the position of a quantum object renders the attribution of the concept ‘momentum’ to that object entirely unintelligible, according to Bohr.¹⁰⁴

Using the example of position, Barad gives the following summary of *her reading of Bohr’s point*:

“position” only has meaning when a rigid apparatus with fixed parts is used [...]. And furthermore, any measurement of “position” using this apparatus cannot be attributed to some abstract independently existing “object” but rather is a property of the *phenomenon*—the inseparability of “observed

of our lacking knowledge of the system under investigation. They are instead genuinely inscrutable indeterminacies as Barad also argues. See Faye (2019) for more on this distinction.¹⁰⁴ It is worth pausing here to observe that this is how far consensus extends among Bohr scholars. It remains debated for instance how exactly Bohr viewed the wave function and relatedly, why Bohr insists that complementary concepts are only meaningful in the relevant experimental context. However, as Faye and Jaksland (2021) find, even with this variety among Bohr scholars, Barad’s interpretation of Bohr is rather different from the other interpretations of Bohr found in the literature.

object” and “agencies of observation”¹⁰⁵ (Barad 2003, 814, emphasis in original).

Since a set-up that measures, for instance, position is incompatible with a measurement of momentum, it is not the quantum object that can be ascribed a property in an experimental context, but rather the relationality of quantum object and experimental setup, the “phenomenon,” that has the property. Importantly, the composition metaphor used here is only instructional and does not carry ontological significance. Rather, Barad argues that

phenomena do not merely mark the epistemological inseparability of “observer” and “observed”; rather, *phenomena are the ontological inseparability of agentially intra-acting “components.”* That is, phenomena are ontologically primitive relations—relations without preexisting relata (Barad 2003, 815, emphasis in original).

The phenomena do not come into being through *inter*-action between independently existing elements: object and apparatus (agency of observation). Rather, phenomena form the ontologically primitive and “relata-within-phenomena emerge through specific intra-actions” (Barad 2007, 140). *Intra-actions*, in other words, produce the ontologically emergent object and apparatus including the place of their separation: “Reality is composed not of things-in-themselves or things-behind-phenomena but of things-in-phenomena” (Barad 2007, 140). Barad (2007, 140) describes such a separation between object and apparatus as an “agential cut” (more commonly known as a Heisenberg cut) and argues that no agential cut is an inherent distinction. Rather, agential cuts are constituted by specific intra-actions, such that other intra-actions constitute different cuts into object and apparatus (agency of observation).

According to Barad, this refutes the “conventional (Newtonian) view of metaphysics, whereby there are individual objects with individually determinate properties, and measurements reveal the preexisting values of particular physical quantities” (Barad 2007, 262). In this way, agential realism abandons a “metaphysics of individualism” (Barad 2007, 195), where reality consists of objects between which there are relations. Without an inherent cut, all is phenomena and different cuts enact different individuals. Barad’s ontology – agential realism – thus takes the form of a radical relational holism which Teller, also in the context of quantum mechanics, introduces as the view that there are “*inherent relations* [...] which do not supervene on the non-relational properties of the distinct individuals” (Teller 1986, 73). The relational holism of agential

¹⁰⁵ Barad borrows the notions ‘phenomenon’ and ‘agencies of observation’ directly from Bohr though she arguably bends their meaning for her own purposes.

realism is radical since *only* the relational phenomena are ultimately real.¹⁰⁶ Cuts between objects, and between objects and agencies of observation, emerge from these phenomena and intra-actions within phenomena will change them. Likewise, any division into subject and object is emergent and changing. Indeed, Barad argues that the “*quantum dis/continuity* troubles the very notion of *dichotomy* – the cutting into two – itself” (Barad 2010, 246, emphasis in original).

From Bohr’s reasoning that complementary properties are only meaningful relative to a specific experimental context, Barad also argues that meaning must be enacted by these cuts since the experimental contexts in turn are enacted via specific intra-actions: “It is through specific agential intra-actions that the boundaries and properties of the ‘components’ of phenomena become determinate and that particular embodied concepts become meaningful” (Barad 2003, 815). Barad thus does away with what she calls representationalism or word-world dualism: “the independently determinate existence of words and things” (Barad 2007, 107). Generalizing from Bohr’s observation that complementary experimental contexts and their associated properties exclude one another (for instance measurements of position and momentum), Barad furthermore argues that certain intra-acted configurations of boundaries, properties, and meanings exclude other such configurations: “Any particular experimental arrangement, which gives determinate meaning to a particular concept (for example, ‘position’) will, by necessity, always produce its constitutive exclusion (for example, ‘momentum’), that is, an equally necessary, ‘complementary’ concept which is thereby left outside of the domain of intelligibility” (Barad 2010, 253). By this exclusion, the intra-actions are in a sense “agential” and a pervasive agency in all intra-actions therefore prevails in Barad’s agential realism. Barad describes it as the “ongoing flow of agency through which part of the world makes itself differentially intelligible to another part of the world” (Barad 2007, 140). The seat of agency is not human beings or consciousness. Rather, without the subject-object and word-world (material-discursive) dualisms there are no principles with which to separate agency and (inanimate) matter: “In an agential realist account, agency is cut loose from its traditional humanist orbit” (Barad 2007, 177).¹⁰⁷

In summary, Barad promotes phenomena as the fundamental ontological unit which immediately entails that objects (with determinate properties) only

¹⁰⁶ In this respect, agential realism shares some similarity with the type of priority monism defended by Schaffer (2010) and Ismael and Schaffer (2016).

¹⁰⁷ Few other interpretations find that quantum mechanics has implications for meaning and agency, and none of the mainstream interpretations do so. The conclusions that Barad allegedly derive from quantum mechanics regarding meaning and agency should therefore be treated with some caution. However, as previously stated, the purpose here is not to evaluate the legitimacy of Barad’s interpretation of quantum mechanics.

emerge from this whole. In treating individuals as ontologically non-fundamental, agential realism resembles other quantum mechanics-based ontologies that emphasize non-separability, for instance ontic structural realism (advocated by Ladyman and Ross (2007) among others). However, while ontic structural realism (typically) focuses on the intrinsic relationality in states of entangled particles such as that between electrons,¹⁰⁸ i.e., on intra-level structures, agential realism emphasizes the inseparability between observer and observed, i.e., inter-level relationality. Though the former should, in principle, imply the latter and vice versa, it is arguably this change in emphasis that propels agential realism towards its broader scope compared to other quantum mechanics-based ontologies such as ontic structural realism. Indeed, the next section will indicate how agential realism – especially due to its relational ontology and entailed new view on subject-object, word-world, and agency – has been more influential in feminist metaphysics and philosophical anthropology than in the fundamentality-based metaphysics that ontic structural realism belongs to.

7.2 AGENTIAL REALISM AS FEMINIST METAPHYSICS

Though offered in a somewhat polemic voice, Ladyman and Ross (2007) on their part go as far as to offer a kind of truce to philosophical anthropology by insisting that naturalized metaphysics makes no contact with the themes of philosophical anthropology:

People who wish to explore the ways in which the habitual or intuitive anthropological conceptual space is structured are invited to explore social phenomenology. We can say ‘go in peace’ to Heideggerians, noting that it was entirely appropriate that Heidegger did not attempt to base any elements of his philosophy on science, and focused on hammers—things that are constituted as objects by situated, practical activity—rather than atoms—things that are supposed by realists to have their status as objects independently of our purposes—when he reflected on objects. We, however, are interested in objective truth rather than philosophical anthropology (Ladyman and Ross 2007, 5).

¹⁰⁸ In a few more words, discussions of ontic structural realism often revolve around entanglement and Leibniz’ principle of the identity of indiscernibles in many-particle quantum states which are taken to suggest that the objects apparently featuring in the state are ontologically emergent from the whole (see for instance French 1998; Esfeld 2004; Ladyman and Ross 2007, chap. 3).

Philosophical anthropology is the field of subject of “Heiddeggerians” that study the world as constituted by our situated, human practices. This is a subjective reality that is furnished by what is habitually or intuitively given to us as human beings in social interaction. Its elements depend on our interests and conceptualizations and consequently, it does not meet realists’ requirement of a mind independent reality. In studying this reality, philosophical anthropology is entitled to ignore the findings of our best (fundamental) sciences since they (presumably) have no bearing for the study of a lifeworld dependent on “our purposes,” as Ladyman and Ross put it. Philosophical anthropology and naturalized metaphysics can therefore be pursued without mutual interference, the former being interested in social phenomena, whereas the latter is concerned with fundamental reality.

This type of division voiced by Ladyman and Ross is similar to that introduced by those commenting on the place of feminist metaphysics in metaphysical research. Mikkola finds that the distinction between fundamental metaphysics and feminist metaphysics can be seen as following the choice whether “to focus on the ‘big’, macrolevel phenomena or on the ‘small’, micro-level entities that ground the bigger picture” (Mikkola 2017, 2445) which seems to echo the difference in focusing on hammers or atoms proposed by Ladyman and Ross.¹⁰⁹ Barnes describes how feminist metaphysics “[a]ttempts to get to grips with social kinds and social structures—with the social world that shapes our daily lives” and argues “[t]hey are important questions in metaphysics that go beyond—and perhaps have nothing to do with—the fundamental” (Barnes 2014, 349). Given this characterization of feminist metaphysics, it seems to share (at least in part) the subject matter of philosophical anthropology (in Ladyman and Ross’ construal of it). Furthermore, Barnes notes that such feminist metaphysics might be entirely independent of fundamental metaphysics. Explicating that in feminist metaphysics “the question ‘What is gender?’ turns on what the (non-natural) social world is like,” Barnes (2014, 340) even seems to implicitly contrast feminist metaphysics with naturalized metaphysics in particular.

¹⁰⁹ It should be noted here that Ladyman and Ross (2007, sec. 1.6) strongly object to “levels”-talk and the idea of a bottom level of reality. By the same reasoning they insist to “displace the micro/macro distinction” (Ladyman and Ross 2007, 57). The levels-talk will be kept here since it features both in discussion about the place of feminist metaphysics and in Barad’s work. There are certainly subtle differences between divisions drawn by Mikkola, Barnes, and Ladyman and Ross, but these will not be pursued here. In relation to Ladyman and Ross, levels-talk is merely meant to convey their focus on fundamental physics and its priority compared to philosophical anthropology. Ultimately, Ladyman and Ross (2007, chap. 3) seem to endorse a view similar to Barad’s namely that there is only one level of organization due to the pervasiveness of entanglement.

This alleged division between naturalized metaphysics and feminist metaphysics has, in a sense, already been questioned by Katherine Hawley (2018), when she proposes to generalize naturalized metaphysics to include social metaphysics by having it informed by the findings of the social sciences. However, Hawley's proposal is importantly different from that ascribed here to Barad. In admitting a role for the findings of the social sciences in naturalized metaphysics, Hawley is effectively alleviating the fundamentality focus otherwise found in naturalized metaphysics. It is in other words another example of the permissive solution to the antagonism between fundamentality-focused and feminist metaphysics. Barad's resolution of the division between naturalized metaphysics and non-fundamental metaphysics is very different since Barad, as seen, instead argues that fundamental science, quantum mechanics in particular, is directly relevant for social metaphysics. As such, Barad continues the focus of naturalized metaphysics on fundamental science, the view that is otherwise an epitome in metaphysics of the fundamentality focus responsible for the tension with feminist metaphysics. However, Barad argues that the metaphysical implications of quantum mechanics as summarized in agential realism cuts across to the domains of philosophical anthropology including feminist metaphysics. More on this argument in section 7.4.

Barad is very explicit that agential realism can and is meant to inform feminism, writing in the introduction that "agential realism can be useful for thinking about specific issues that have been central to feminist theory, activism, and politics" (Barad 2007, 34). One of these issues is the question of the interdependence of matter, agency, and discursive practices. As detailed above, Barad argues for the absence of any set dualism between word and world. Rather, the material and the discursive are enacted together within phenomena as part of the configurations into elements that by complementarity will exclude other configurations. This was what Barad argued entailed a pervasive agency in the world not restricted to human beings and one that takes place as agential intra-actions. According to Barad, this does not merely echo themes found in feminism, but promises a revision of them:

agential realism diverges from feminist postmodern and poststructuralist theories that acknowledge materiality solely as an effect or consequence of discursive practices. These latter approaches lack an account of materiality as an agential and productive factor in its own right, thereby reinstating the equation between matter and passivity that some of these approaches proposed to unsettle (Barad 2007, 225).

In proposing such an integration of the material and discursive and in providing a framework in which matter becomes agential, Barad's work has resonated with

and been particularly influential in new materialism (also denoted material feminism (Alaimo and Hekman 2008)). New materialism is a multi-faceted school of thought but might generally be characterized by the return of matter and materiality in a reaction to the linguistic turn in philosophy and critical theory¹¹⁰ accompanied by a shift in emphasis from epistemology to an integration of ontology and epistemology (Gamble, Hanan, and Nail 2019, 118). One aspect of this is that “new materialism pushes dualism into non-dualism, thus allowing for a non-reductive take on matter and language” (Dolphijn and Van der Tuin 2012, 113). It is particularly towards this end that Barad’s agential realism has been influential in new materialism, not only in questioning dualisms, but also through the framework of agential intra-actions that has proven both theoretically and methodologically important for “[t]he argument in new materialisms that matter is generative, changing and agentic” (Coleman 2014, 41; see also Kirby 2017). It is exactly this agency in matter that Barad, in the quote above, takes agential realism to capture. Furthermore, by its origin in quantum mechanics, agential realism might be seen as providing a scientific sanctioning of these ideas in new materialism. While not put in quite those terms, agential realism’s relation to quantum mechanics is noted in the new materialism literature. One example follows a discussion of the integration of ontology and epistemology and the pervasiveness of agency with the remark that “Barad provides a particularly compelling basis for such a view through her ‘intra-active’ account of the ‘measurement problem’ in quantum physics” (Gamble, Hanan, and Nail 2019, 122).¹¹¹

This is not the place for a detailed treatment of Barad’s contributions to new materialism or other related fields, nor is it an attempt to justify or assess the merits of new materialism. Rather, the above hopefully testifies to the role of agential realisms in a recently influential branch of feminist metaphysics. As Fairchild and Taylor write of Barad, “her influence in the fields of new materialism, new material feminism, science studies, queer studies, and posthumanism has been profound” (Fairchild and Taylor 2019). With the wide reception in such fields, the question is perhaps not so much whether Barad’s work can in part be regarded as feminist metaphysics, but rather in what sense it qualifies as naturalized and thus fundamental metaphysics. This is what we

¹¹⁰ See van der Tuin (2011) for a more nuanced reflection on this relation to the linguistic turn.

¹¹¹ That the quantum origin – or perhaps rather the origin in our current best science – plays a role for the reception of agential realism in new materialism is also indicated by remarks such as: “Barad develops her problematization of representational thinking via a detailed account of the scientific apparatus through which reality is observed and measured in quantum physics” (Coleman 2014, 35) and “Karen Barad’s (2012c) recent discussions with quantum field theory assist greatly in this endeavour to reconsider negativity” (Hinton 2017, 234).

shall turn to in the next section that argues that Barad’s work exemplifies several of the central tenets of naturalized metaphysics.

7.3 AGENTIAL REALISM AS NATURALIZED METAPHYSICS

In the words of Anjan Chakravartty “[n]aturalized metaphysics is metaphysics that is inspired by and constrained by the output of our best science. Non-naturalized metaphysics is metaphysics that is not so inspired or constrained” (Chakravartty 2013, 33). While non-naturalized metaphysics runs wild and often astray,¹¹² according to the proponents of naturalized metaphysics, the (epistemic) legitimacy of naturalized metaphysics is secured by its deference to the findings of science (thus taking the form of a strict metaphysical naturalism in the sense of Kornblith (2016)). A moderate fundamentality focus is already entailed in naturalized metaphysics by its deference to science in general. However, this fundamentality focus is amplified when this deference to science often explicitly prioritizes physics. This is prominently exemplified by Ladyman and Ross’ *“Primacy of Physics Constraint”* according to which “evidence acceptable to naturalists confers epistemic priority on physics over other sciences” (Ladyman and Ross 2007, 37) and from which it follows that “for a metaphysical claim to be taken seriously it must relate to at least one specific scientific hypothesis of fundamental physics” (Ladyman and Ross 2007, 39). Similarly, Alyssa Ney argues that “[t]he best way to have science inform a project of metaphysics is for us to seek what sorts of representational devices are indispensable to physics” (Ney 2012, 76).¹¹³ With this reliance on (fundamental) physics – arguably the science that can most rightfully be said to concern itself with fundamental reality – naturalized metaphysics seems to share Sider’s view that for metaphysics “[t]he ultimate goal is insight into what the world is like at the most fundamental level” (Sider 2011, 1; cited in Barnes 2014, 336), the view with which Barnes exemplifies the emphasis on fundamentality in mainstream metaphysics. According to naturalized metaphysics, metaphysics must be informed and constrained by science and physics in particular, and any metaphysics not so constrained is illegitimate where the latter includes metaphysics informed by outdated science such as Newtonian mechanics.

The criticism of metaphysics based on outdated science is captured in Ladyman and Ross’ disapproval of “philosophy of A-level chemistry” (Ladyman and Ross 2007, 24). Barad considers this theme, too, when she observes that even naturalistically inclined metaphysics is often embedded in an outdated

¹¹² For details about this criticism of traditional, non-naturalized metaphysics see for instance Ladyman and Ross (2007, chap. 1) and Bryant (2020a).

¹¹³ Other examples of an (implicit) endorsement of this primacy of physics are for instance Maudlin (2007b, 1–2) and Morganti (2013, 6–7).

Newtonian world view. “What is needed is a reassessment of physical and metaphysical notions that explicitly or implicitly rely on old ideas about the physical world – that is, we need a reassessment of these notions in terms of the best physical theories we currently have” (Barad 2007, 24). Even though Barad here speaks only of “notions” that must be reassessed in the light of our best scientific theories, she elsewhere insists that her naturalism does require a general concession to the findings of science. This attitude, though, is not without qualification since Barad qualifies that “a suitably revised conception of naturalism takes seriously what our best scientific theories tell us while simultaneously holding science accountable for its practices, for its own sake as it were, in order to safeguard its stated naturalist commitments” (Barad 2007, 407). Thus, Barad seems to defend a moderate, naturalized metaphysics where metaphysics is inspired and constrained by science, but which also leaves a distinctive task for philosophers.¹¹⁴ Nevertheless, Barad’s approach to metaphysics exemplifies a form of metaphysical naturalism.¹¹⁵

In her account of the relation between agential realism and quantum mechanics, Barad corroborates the characterization of her as a moderate, naturalized metaphysician at least in that domain. “I argue that agential realism can in fact be understood as a legitimate interpretation of quantum mechanics” (Barad 2007, 94). Agential realism is not a (wild) metaphysical speculation with some analog to quantum mechanics. It is a metaphysics that is *inspired* and *constrained* by quantum mechanics in such a way that it can serve as a “legitimate interpretation” (presumably among other legitimate interpretations). Agential realism offers a fundamental metaphysics based on quantum mechanics and is justified given the standards of naturalized metaphysics. An important question, however, is whether this naturalism extends beyond quantum mechanics, i.e., whether agential realism as it applies to the domains of philosophical anthropology should still be regarded as a naturalized metaphysics based on and justified by quantum mechanics.

¹¹⁴ In this regard, Barad parts ways with strict naturalized metaphysics as defended by Ladyman and Ross (2007, 27), Maudlin (2007b, 1) and Ney (2012, 54) and adopts a more moderate, naturalized metaphysics as expounded by Morganti and Tahko (2017), though the intended role for the philosopher is somewhat different.

¹¹⁵ As Rouse (2004) observes, the commitments that Barad derives from this metaphysical naturalism are notably different from those of most metaphysical naturalists. In particular, she endorses a view of science as inherently normative due to the intra-active nature of the phenomena: “On [Barad’s] account, science does not construct a representation of anormative nature but instead actively reconfigures the world as already conceptually articulated and politically consequential” (Rouse 2004, 156). This does *not* imply that Barad rejects metaphysical naturalism, but rather that she extracts different conclusions from the deference to the findings of science entailed by metaphysical naturalism.

There are at least two alternatives to this conception of agential realism as a naturalized metaphysics. First, agential realism might be considered merely analogous to quantum mechanics.¹¹⁶ When agential realism uses concepts and ideas that originate in quantum mechanics – entanglement, apparatus, phenomena, etc. – outside this context, they should be understood metaphorically or analogously to their quantum mechanical sense.¹¹⁷ Observe that this conception is already in tension with Barad’s insistence that agential realism is a legitimate interpretation of quantum mechanics and not merely an interesting analogy to some of the features of quantum mechanics. The second alternative conception of agential realism is to regard it as an overarching metaphysical template that is claimed to be instantiated by quantum mechanics and which may also be instantiated in other domains, for instance within the themes described under the heading of philosophical anthropology.¹¹⁸ Agential realism would, according to this conception, merely entail a particular organization of things. Adopting a bit of imagery, agential realism would be a bowl admitting many different kinds of content. With this conception, the concepts and ideas in agential realism that originate in quantum mechanics would be content neutral generalizations of their quantum mechanical counterparts and it is then these generalizations that are conjectured to apply also in the field of philosophical anthropology.¹¹⁹ Barad, however, rejects both of these conceptions of agential realism defending instead a conception of agential realism as naturalized metaphysics, i.e., as a metaphysics constrained and justified by science irrespective of the context in which this metaphysics is applied.

¹¹⁶ This conception is for instance implicit when Vetlesen asks “how representative, and thereupon generalizable, is the laboratory experiment that Barad continues to hold fast to?” (2019, 133).

¹¹⁷ Such an analogy relation is exemplified by Haraway’s (1992) development of the methodological concept of ‘diffraction’ whose original context, optics, merely serves as analogy or metaphor.

¹¹⁸ This understanding of agential realism as a metaphysical template seems to be implicit in Hollin et al. as exemplified by remarks such as “[a]gential realism is *deployed* across a range of scales” (2017, 25, emphasis added), by their suggestion that concepts such as entanglement and diffraction “*travel* with Barad from physics” (2017, 936, emphasis added), and when they worry that “the rules that govern quantum realms must *also be deemed applicable* in macro contexts” (2017, 936, emphasis added). To the contrary, I shall here defend the reading that agential realism is only deployed and applied once, as an account of fundamental reality. It thus never leaves physics, but rather extends its scope from there to the macroscopic contexts.

¹¹⁹ This multiple instantiation conception is arguably how quantum mechanics is viewed in the generalized/weak quantum mechanics literature (see Atmanspacher, Römer, and Walach 2002; Filk and Römer 2011).

In particular, Barad (2007, 6; 7; 18; 24; 70; 88; 2012b, 45) dismisses any conception of agential realism as analogy:¹²⁰ “I am not interested in drawing analogies between particles and people, the micro and the macro, the scientific and the social, nature and culture; rather, I am interested in understanding the epistemological and ontological issues that quantum physics forces us to confront” (Barad 2007, 24). Agential realism is not a suggestion to explore people, the social, culture, and generally the macroscopic world using analogies and metaphors from quantum mechanics. Rather, agential realism with all its consequences for philosophical anthropology comprises those epistemological and ontological lessons that “quantum physics forces us to confront”. Similarly, to conceive of agential realism as a metaphysical template instantiated by quantum mechanics and with the possibility to be instantiated in the macroscopic domain would involve an, for Barad, illegitimate stratification of ontology into separate realms: “quantum mechanics is not a theory that applies only to small objects; rather, quantum mechanics is thought to be the correct theory of nature that applies at all scales. As far as we know, the universe is not broken up into two separate domains” (Barad 2007, 85). Quantum reality is all the reality there is, and its metaphysics is described, according to Barad, by agential realism. This is why it is justified to apply agential realism even at the macroscopic domain. The macroscopic domain is not independent as required by the multiple instantiation conception of agential realism but rather derived from or grounded in the quantum world.

Thus, even in its application to the macroscopic domain, Barad argues that agential realism is a metaphysics justified by quantum mechanics. Knowing the ambition of Barad’s engagement with the macroscopic domain, agential realism therefore promises to be a naturalized metaphysics that ventures deeply into the realm of philosophical anthropology including when agential realism is utilized in for instance new materialism.¹²¹ Barad thereby aspires to break the truce offered by Ladyman and Ross to the Heideggerians and more importantly, she implicitly rejects any principled distinction between mainstream/fundamental metaphysics focused on small, micro-level, or fundamental phenomena and feminist metaphysics focused on large, macro-level, or non-fundamental phenomena (“like gender and social structure”

¹²⁰ A similar observation is made by Hollin et al., when they write: “Quantum physics, for Barad, is resolutely *not* a metaphor but, rather, underpins agential realism’s articulation of how the material world is brought into being” (2017, 935).

¹²¹ Aside from her commitment to these central tenets of naturalized metaphysics, it has elsewhere been argued that Barad endorses other naturalist attitudes including: “the continuity between philosophy and science; the insistence that philosophical explication of science be accountable to ongoing scientific practice; a thoroughgoing materialism (albeit in the sense of agential materiality, not a more traditional physicalism); and the rejection of any appeal to the magical or supernatural” (Rouse 2004, 156–57).

(Barnes 2014, 336)). As Barad concludes above, “the universe is not broken into two separate domains.” There is only one level of reality and it includes everything from the fundamental to the social world.

7.4 THE POSSIBILITY OF METAPHYSICAL APPROXIMATION

Barad’s vision, then, is to base her metaphysics in quantum mechanics and at the same time have it inform many of the themes typically within the range of feminist metaphysics. It seems, however, to be overextending the scope of a quantum metaphysics when it is brought to bear on the macroscopic domain. This is so, even if we accept that this domain is ultimately an aspect of the one reality that is most truthfully described by quantum metaphysics. As Barad also recognizes, Newtonian mechanics is a very good approximation for quantum mechanics in the macroscopic domain, and Newtonian mechanics does not include the peculiar effects – entanglement in particular – that are so important for Barad’s development of agential realism.¹²² The quantum peculiarities are, in other words, washed out as we move to the length-scales that we typically encounter in our lifeworld. As a consequence, one might argue that quantum metaphysics must similarly be irrelevant at these length scales and therefore of no concern to, for instance, philosophical anthropology. Agential realism would, according to this argument, have no probative force in our theorizing about the lifeworld contrary to what Barad claims.

Barad has, as mentioned, no quarrel with the size of quantum effects:

quantum effects are of the order of the ratio of Planck’s constant (h) to the mass of the object in question (m). While electrons, atoms, and other very-small-mass objects have fairly significant h/m ratios, for macroscopic objects, like cats, the ratio of h/m is extremely small. It is not that we live our daily lives in a classical world, rather than a quantum one; the point is that we generally don’t notice quantum effects because they are very small (too small to notice without special equipment) (Barad 2007, 279).

Obviously, if Planck’s constant had been larger or we had been much smaller, then quantum effects would have been more significant. Thus, quantum effects

¹²² Exactly how Newtonian mechanics is obtained as a limit of quantum mechanics is still shrouded in some mystery though the decoherence theory – pioneered by Zeh (1970) – has come a long way in explaining this transition (see Zeh (1996) and Schlosshauer (2007) for accessible introductions). The details are not important here, since the present concern is simply that that this quantum-to-classical transition does in fact occur which is confirmed by the success of Newtonian physics in the macroscopic domain.

could have been manifest even in our lifeworld, they just happen not to be since they are (typically) too small to notice. This can, in other words, not be Barad's reply to an assumption that quantum metaphysics is irrelevant at the length scales typically encountered in our lifeworld.

Before exploring why Barad nevertheless insists on the relevance of quantum metaphysics even in philosophical anthropology, it is worth pausing to observe how the role of Planck's constant offers the first modification of the claimed division between naturalized metaphysics and philosophical anthropology. It is the (apparently) contingent size of Planck's constant that ensures the immediate irrelevance of quantum metaphysics, i.e., the metaphysics of our fundamental physics, in our theorizing about the lifeworld. Certainly, even "things that are constituted as objects by situated, practical activity" (Ladyman and Ross 2007, 5) would have had to be reconceived in the light of quantum metaphysics if Planck's constant had been much larger since quantum effects would then have been so significant that they would arguably influence both situatedness and practice. Of course, if Planck's constant had been much larger, then quantum metaphysics would have been manifest and philosophical anthropologists would therefore not have been prone to presume any other metaphysics. Thus, a larger value for Planck's constant is not a reason to expect that conflicts between naturalized metaphysics and philosophical anthropology would be more likely. To the contrary, through its studies of this now quantum influenced lifeworld, this philosophical anthropology would instead become relevant evidence for the fundamental quantum metaphysics. Had Planck's constant been much larger, then the autonomy of philosophical anthropology and naturalized metaphysics would have been lost *in both directions*. In drawing their distinction in terms of those "interested in objective truth rather than philosophical anthropology," Ladyman and Ross (and likewise for Barnes and Mikkola) instead give the impression that this is a principled distinction. The present argument, however, suggests that this cannot be so. It is rather a contingent matter of fact – the size of Planck's constant – that ensures the independence of naturalized metaphysics based on quantum mechanics and philosophical anthropology.

Barad, however, seems to insist on the relevance of agential realism, i.e., a quantum metaphysics, in all domains even with the actual size of Planck's constant. One could suppose that this is because Barad regards it to be large enough for quantum effects to be significant, but instead she dismisses the relevance of the size of the Planck's constant altogether. Speaking again of the ratio between Planck's constant and the mass of an object, Barad writes:

the fact that this ratio is not strictly zero is the key point. In other words, the fact that Newtonian mechanics provides good approximations to the exact quantum mechanical solutions for

many macroscopic situations is not evidence against the new epistemology or ontology suggested by my elaboration of Bohr's account (2007, 416).

The epistemological and ontological implications of agential realism are unaffected by the size of Planck's constant, which suggests it to be a misconception to regard agential realism as a mere quantum metaphysics whose effects then carry through to the macroscopic domain with an intensity depending on the size of Planck's constant. While the smallness of Planck's constant explains "why we were fooled for so long into thinking that we live in a classical world and that the classical epistemological and ontological assumptions apply" (Barad 2007, 457), the fact that it is non-zero everywhere entails that Newtonian metaphysics does not apply anywhere.

Yet, without further argument, Newtonian metaphysics might still obtain as an approximation in the domain where Newtonian mechanics is a good approximation of quantum mechanics. While Barad rejects this reasoning, she only ever alludes to the argument resisting it. However, her point seems to be that the contents of agential realism – such as the rejection of the subject-object and word-world dualisms – are not features whose presence or absence will depend on the size of Planck's constant and, therefore, on the length-scale at which a system is described. If the subject-object dualism is absent at the fundamental level, then how could it suddenly come into existence at a higher level of organization in the same reality? Or if representationalism (the word-world dualism) fundamentally fails, then how can it suddenly begin to succeed? The intuition seems to be that these are features of an ontology that are either there or not there. They cannot differ in magnitude and there is therefore no way for them to obtain as better and better approximations as we move to larger length-scales. Barad, in other words, seems to argue that such features cannot gradually appear (or diminish) as we zoom out from the fundamental level of reality or when we consider only the larger objects of our lifeworld.

Consider again the case frequently visited by Barad, where some agency of observation does a measurement on a quantum object. As detailed in section 7.1, Barad's interpretation of quantum mechanics entails that neither the observed object, nor the agency of observation including the measurement apparatus and the experimenter have independent existence. Rather, they are intra-actively produced within the ontologically primitive phenomena. They form a relational whole that is continuously differentially enacted. Attributing the insight to Bohr, Barad writes, "quantum physics teaches us that the belief in an inherent fixed Cartesian distinction between subject and object is an unfounded prejudice of the classical worldview" (Barad 2007, 359). No subject-object dualism can be sustained in the quantum world or when doing

measurements on quantum objects (again remembering that the composition metaphor is only instructional). If we add a couple of neutrons, protons, and electrons to the system being studied, the same conditions will apply. If the subject-object dualism cannot be sustained for, say, a single electron then the same will be the case for a small collection of particles. Barad's monism, however, entails that everything is made up of such quantum particles (or rather the relational whole from which they emerge as particles). Barad's argument that there is no subject-object dualism at any level of description might therefore, as indicated above, be seen as relying on the absence of a good answer to the question of where the subject-object dualism is (re)installed as we move from studying these quantum systems to the entities of our lifeworld. Even if the entanglement between agency of observation and object is negligible for some practical purpose in the macroscopic domain, the entanglement is nevertheless still there. Indeed, Barad warns us not "to confuse practical considerations with more fundamental issues of principle" (Barad 2007, 110). If the entanglement remains, then the subject-object dualism never obtains. If this is so, then the features of agential realism – such as the absence of this dualism – will have to be considered even in our theorizing about the lifeworld, for instance in feminist metaphysics, assuming that there is only one reality with no ontological stratification.

Stating this in more general terms, if an ontology lacks/contains features that cannot appear/disappear as the result of approximation then these features will be absent/present throughout the ontology regardless of scale. No parameter controls these ontological features such that they can appear/disappear as we go from the fundamental to the higher levels of organization. These features are somehow all or nothing and therefore robust between different levels of ontology. The possible existence of such scale-independent elements of an ontology – possible examples including the mentioned dualisms, representationalism, and (joint carving) notions – is the second and more significant challenge to the truce between naturalized metaphysics and philosophical anthropology. If a naturalized metaphysics contains such features, then they will remain relevant even in theorizing about the lifeworld.

However, whether a metaphysics of individualism holds could similarly be regarded as a question of all or nothing. Either there are individuals, or there are not. Regardless, it seems immediately more agreeable to regard this as something that can obtain through approximation. Circumstances can be such that a fundamentally relational metaphysics can appear to be one of individuals (if they are separable enough). Intuition is perhaps helped here by the integration of Newtonian mechanics and a metaphysics of individualism. Thus, comprehending how Newtonian mechanics can obtain through approximation

aids the grasp of a metaphysics of individualism as an approximation on its own. Perhaps subject-object dualism or representationalism could similarly obtain as approximations, though the way they do so remains more elusive.

A general argument favouring such approximation – however incomprehensible the approximation appears – can be to point, once again, to the acknowledged fact that Newtonian mechanics is a good approximation of quantum mechanics at the macroscopic domain. One might argue that the Newtonian metaphysics should consequently also be a good approximation of quantum metaphysics. This could be seen as following from a type of no-miracles argument whereby the success of Newtonian mechanics would be a miracle if Newtonian metaphysics were not even approximately true. This argument can of course be resisted by accepting the miracle and insisting that Newtonian metaphysics is never a good approximation of quantum metaphysics and thus of the fundamental metaphysics, but without further specification this simply begs the question. With this ‘no metaphysical approximation’-argument being only implicit in Barad’s work, it is difficult to say how she would respond to this no-miracles argument for metaphysical approximations. However, the idea that metaphysical approximations are impossible (at least for elements such as the mentioned dualisms) serves as a way to argue that there can only be one metaphysics and thereby no principled divisions among branches of metaphysics for instance following a division of fundamental vs. non-fundamental. If metaphysical approximations are impossible, then all metaphysics is integrated. This is the radical way in which Barad resolves the tension between mainstream and feminist metaphysics.

7.5 THE CONSEQUENCES OF NO DIVISION

Barad’s agential realism promotes phenomena as ontologically primitive. These are inseparable wholes from which the objects of investigation and the agency of observation emerge. According to Barad, this holism undermines the metaphysics of individuality. It is intra-actions within phenomena that enact individuals, thus rendering individuals emergent. Furthermore, it challenges established dualisms such as subject-object, knower-known, and word-world.

Relational ontologies and the questioning of the mentioned dualism are arguably not news to feminist metaphysics nor to feminism more generally. Indeed, Barad explicitly mentions several predecessors including Butler (1993), Haraway (1997), and Kirby (1997). Barad’s call to abandon the Newtonian metaphysics of individualism, for instance, thus appears less relevant to recent feminist theory, but it is perhaps instead directed at more traditional approaches in (social) metaphysics. Indeed, Maralee Harrell describes Barad as someone “who offers a metaphysical interpretation of quantum mechanics that takes into account not

only the views of the theory's creators, but also much recent research in feminist science studies" (Harrell 2016, 27). Arguably, Barad's role in the advent of new materialism does testify to the interesting ideas that agential realism introduces.¹²³ However, in line with Harrell's remark, the present paper can be seen as arguing that one of Barad's important contributions is exactly of more methodological character when she attempts to integrate ideas already existing in feminism with the fundamentality-focus that quantum mechanics provides for.

Those of Barad's arguments that have been considered here are, as a consequence, not primarily concerned with first order content of feminism. Rather, they strike this more methodological note in being concerned with the self-image of feminism in general and feminist metaphysics in particular. If feminist metaphysics makes contact with the fundamental metaphysics of quantum mechanics, as Barad argues, then feminist metaphysics does not have to defend its place in metaphysics besides the fundamentality-focused undertakings. Rather, feminist metaphysics is itself, in a sense, fundamental metaphysics and one that can be justified with appeal to quantum mechanics and fundamental science in general just like the traditionally fundamentality-focused naturalized metaphysics.

Barad, however, does not thereby argue that feminist metaphysics should abandon its analysis of the social lifeworld in favor of the details of quantum mechanics. "What is needed is an analysis that enables us to theorize the social and the natural together" (Barad 2007, 25). Indeed, if certain metaphysical features must be the same across all levels of description because they do not admit approximation, then these can arguably be identified and studied at any level. While Barad is mostly concerned with arguing that feminist metaphysics and social theorizing in general must therefore attend to the findings of quantum mechanics, she also seems to argue that fundamentality-focused metaphysics must likewise be sensitive to philosophical anthropology including feminist metaphysics. If careful analysis of our lifeworld for instance indicates that there is no subject-object dualism, then this would, by Barad's argument, be evidence that this dualism is absent at all levels of description, including that of fundamental metaphysics. As such, metaphysics for Barad is truly integrated and must be approached by a diffractive methodology that reads the fundamental and non-fundamental through each other. Barad's metaphysics is naturalized, fundamental, and feminist all at once.

¹²³ Readers more interested in Barad's first order contributions rather than the methodological issues discussed here are referred to, e.g., Fairchild and Taylor (2019) and references therein.

8 CONCLUSION

As announced already in the introduction, the chapters of this thesis do not come together into one argument but rather serve to exemplify a particular approach to naturalized metaphysics that focuses on the metaphysics it provides for rather than the soundness of its core commitments. With that said, however, this conclusion will nevertheless try to summarize some of the main findings of the preceding chapters, how they serve to complete the picture of naturalized metaphysics as it is usually presented, and indicate possible venues for further exploration.

Naturalized metaphysics is a type of metaphysics or, perhaps rather, a suggestion for how to do metaphysics. It is, however, just one among many approaches to and conceptions of metaphysics. It has been beyond the scope here to review the relation between all these and naturalized metaphysics, but chapter 7 outlined how naturalized metaphysics does not necessarily fit into established dichotomies such as that between fundamental and non-fundamental metaphysics. Indeed, the findings of science may not only change our metaphysical beliefs but also our conceptions of metaphysics as a discipline. Chapter 3 also partook in this work to lay out the place of naturalized metaphysics in the metametaphysical landscape. Of particular interest in this regard is perhaps the differences between naturalized metaphysics and other naturalistic approaches to metaphysics including Quinean naturalism and experimental philosophy. However, before proceeding to the details of these differences, it is relevant to first review the findings of this thesis relating to the naturalism of naturalized metaphysics.

As the name indicates, naturalized metaphysics involves a kind of naturalism. That this is a scientific naturalism – and not a naturalism characterized by a rejection of the supernatural – is also clear. Here, however, a certain amount of ambiguity creeps in, not primarily because the naturalistic commitments of naturalized metaphysics are unclear but rather because of the various denotations of ‘naturalism’. Naturalized metaphysics argues that the findings of science should inform, constrain, and motivate metaphysics, and this was argued to make naturalized metaphysics an adherent of ontological scientific naturalism (as this term is used here). Others, however, have characterized naturalized metaphysics as a type of methodological naturalism. The important point in this regard is not what to call the position. Rather, this thesis has emphasized that naturalized metaphysics does not promote the adoption of the methods of science in metaphysics and philosophy more generally, as for instance proponents of experimental philosophy do. Naturalized metaphysics is not a methodological naturalism in this sense.

Relating to the naturalism of naturalized metaphysics, a point was made of showing the Sellarsian character of this naturalism. While these similarities in themselves are mostly of historical interest (the connection between Roy Wood Sellars and naturalized metaphysics is at most indirect), they serve to emphasize how especially the criticism of the traditional methods of metaphysics originate in a commitment to a naturalism that takes seriously that philosophers are part of nature as revealed by science. This, however, is also one of the occasions for further research. Whereas this place of the philosopher in nature is central for the criticism of the traditional methods of metaphysics, similar reflections are not made about the positive program in naturalized metaphysics. Perhaps there are also limits to naturalized metaphysics imposed by limitations due to our evolutionary origin that might affect our ability to infer metaphysics from science – limitations that might also impact our capacity to do science itself.

Just as the literature can be ambiguous with respect to the naturalism endorsed by naturalized metaphysics, it can also give rather different impressions of the view of metaphysics within naturalized metaphysics. At places, naturalized metaphysics is presented as anti-metaphysical, a conception that is amplified by its occasional association with logical positivism. This, however, is a mischaracterization. Naturalized metaphysics is metaphysically realist in the sense that it does not aim to deflate or change the traditional subject matter of metaphysics. ‘Metaphysics’ for the naturalized metaphysicians is meant to carry its usual significance, and their aim, like that of more standard ‘inflationary’ metaphysicians, is to establish truths about ultimate reality. Since it is central to the dialectic of many of the later chapters of this thesis, chapter 3 showed with quite some care that this is the case, contrasting the view of naturalized metaphysics as more committed to realism even than other alleged realists like Quine and Thomasson. Indeed, this metaphysical realism on the part of naturalized metaphysics was central to the reasoning in chapter 4 that naturalized metaphysics is not, as Ney claims, a metaphysics that might be acceptable even to the logical positivists. Where the logical positivists worried that metaphysics is semantically defective, naturalized metaphysics is concerned with how to secure the *epistemic* legitimacy of metaphysics while taking its semantics credentials for granted. With this difference in emphasis, it is not surprising that naturalized metaphysics has little to say to the semantic worries since this was never the aim (though Ney is a notable exception).

This epistemic focus also changes what aspects of metaphysics that can be subjected to criticism by naturalized metaphysics. Those who are critical of metaphysics for semantic reasons will – as Carnap (1950), for instance, exemplifies – be equally critical of metaphysical questions and claims. If the issue is meaningfulness, then questions and claims will be equally problematic.

However, things are different when naturalized metaphysics is concerned with the epistemic credentials of metaphysics. While claims can have epistemic warrant, this is not so for questions. The only quarrel naturalized metaphysics has with metaphysical questions is therefore that some of them can be ill-posed because they include implicit metaphysical assumptions that the scientific theory at which they are directed does not satisfy (for example, asking which motions are forced and which natural in modern science). In general, however, this entails that metaphysical questions largely go free of the worries that naturalized metaphysics has about autonomous metaphysics. The issue is not in general its questions, but that the answers to these questions cannot be justified by means of the traditional methods of metaphysics. In chapter 5, this was used to qualify what naturalized metaphysics should worry about when metaphysics comes into conflict with science. Such conflicts, in accordance with the above, was argued to be problematic when they involve differing claims about the world but not when they are motivated by differing questions. This is an occasion where naturalized metaphysics prove less restrictive than perhaps anticipated, and this moderation originates in the concerns being epistemic rather than semantic in contrast with, for instance, logical positivism.

With the difference between naturalized and autonomous metaphysics being epistemic rather than semantic, more options are opened for their mutual relation. Where a difference in terms of semantics would arguably be rendered binary – meaningful or not meaningful – an epistemic difference can be one of degree. All proponents of naturalized metaphysics argue that a metaphysics based on science is epistemically superior to autonomous metaphysics, the latter being regarded as so epistemically problematic that its conclusions are entirely unjustified. Naturalized metaphysics, it is argued, does better, but with a difference in degree comes the question whether better is good enough. Without further arguments, even the basis in science might be insufficient for naturalized metaphysics to warrant metaphysical belief. In chapter 3 this was argued to be the occasion for a dilemma for naturalized metaphysics. An argument to the effect that naturalized metaphysics is epistemically legitimate would be prone to require extra-scientific resources which could violate the commitment of naturalized metaphysics to only rely on science. However, in the absence of such an argument, one would not be able to demonstrate the ability of naturalized metaphysics to generate justified claims about ultimate reality but only its epistemic superiority to other kinds of metaphysics, thus leaving it open that no metaphysics is, in the end, viable. The latter thus raises the question whether the biggest epistemic risk is involved in doing metaphysics in the first place, autonomous or naturalized. Exploring this question would be another interesting venue for future work.

Chapter 6 discussed how the underdetermination of metaphysics by science puts further pressure on this alleged epistemic superiority of naturalized metaphysics over autonomous metaphysics. In the presence of underdetermination, it was argued, the superiority is difficult to sustain due to complications related to establishing scientifically informed metaphysical possibilities. Without this fallback position, naturalized metaphysics has to overcome underdetermination to sustain its epistemic superiority. The same theme, however, repeats itself. Any attempt to choose between underdetermined metaphysical alternatives is prone to rely on the disputed traditional methods of metaphysics. Chapter 6 argued that naturalized metaphysics, for this reason, has to limit itself to features that are in fact not underdetermined. With a too liberal approach to what counts as an alternative, for instance including those gerrymandered for the purpose of generating underdetermination, no features will be left, and naturalized metaphysics will thereby be unable to deliver any justified metaphysical claims after all. However, in accordance with its deference to science, naturalized metaphysics could argue that only scientifically sanctioned alternatives should be considered for underdetermination. While this is a viable strategy, chapter 6 found that it makes naturalized metaphysics so restrictive that it no longer leaves room for us to be doing anything recognizable as *doing metaphysics*. Despite its differences from logical positivism emphasized above, naturalized metaphysics may therefore in the end not be more hospitable to metaphysicians – and hence their discipline – than these other more eliminative metametaphysical movements.

Where does this thesis leave naturalized metaphysics? The central commitments of naturalized metaphysics have simply been taken for granted throughout, though several aspects of these commitments have been explicated. What I hope the thesis has made some progress towards is clarifying what kind of metaphysics naturalized metaphysics provides for or can provide for. In my own case, the legitimation of metaphysical questions has been the occasion to further the issue of the world-making relation in quantum gravity while remaining in the spirit of naturalized metaphysics (Jakslund 2021a). However, as chapter 5 emphasizes, we must still in such cases be on the guard for domestication. I have also elsewhere raised such concerns about Barad's use of quantum mechanics (Jakslund 2020b; Faye and Jakslund 2021).

It will be speculation what the future is for naturalized metaphysics as a whole. However, if the history of naturalism is anything to go by, then the future will likely bring more naturalistic opposition. As the discussion of Sellars showed, he was not only critical of his contemporary idealists but also of materialists who, he argued, had been too dismissive of the biological and social sciences. Materialism in turn developed as an attempt to follow through on Descartes'

naturalism (Vartanian 1953). Ladyman and Ross likewise begin their criticism with Quinean naturalist metaphysics, though their criticism and their call for naturalization, in the end, primarily applies to what Quinean metaphysics has deteriorated into. Another important point for Ladyman and Ross – and one that has been emphasized above – is the problem of philosophy of A-level chemistry and the associated risk of domestication. The problem, following the familiar pattern, is that these attempts at naturalism are not sufficiently thorough. Again, Ladyman and Ross call for further or, perhaps rather, better naturalization. It appears, if we are to speculate, that the lasting impact of naturalizations is, as such, rarely the positive proposals but rather the opposition. The positive program of any particular naturalism is rarely naturalist enough or, at least, naturalist in the right way in the eyes of its successors. Perhaps this tendency is also on its way with naturalized metaphysics, for instance, when de Ray (2020) argues that an evolutionary skepticism – analogous to that mobilized by naturalized metaphysics in their criticism of the traditional methods of metaphysics – compromises realist science and, de Ray proposes, therefore the basis for naturalized metaphysics. This, obviously, relates to the question raised above whether Sellars' evolutionary naturalism might limit the prospects for the positive program within naturalized metaphysics. Thus, while this thesis has shown that naturalized metaphysics implements many of the naturalist themes already identified by Sellars in the beginning of 20th century, the future opposition to naturalized metaphysics might nevertheless be that it should be even more Sellarsian.

9 BIBLIOGRAPHY

Alaimo, Stacy, and Susan Hekman. 2008. "INTRODUCTION: EMERGING MODELS OF MATERIALITY IN FEMINIST THEORY." In *Material Feminisms*, edited by Stacy Alaimo and Susan Hekman, 1–20. Indiana University Press. www.jstor.org/stable/j.ctt16gzgqh.4.

Allori, Valia. 2015. "Primitive Ontology in a Nutshell." *International Journal of Quantum Foundations* 1 (2): 107–22.

———. 2021. "Spontaneous Localization Theories with a Particle Ontology." In *Do Wave Functions Jump?*, edited by Valia Allori, Angelo Bassi, Detlef Dürr, and Nino Zanghi, 73–93. Cham: Springer International Publishing. https://doi.org/10.1007/978-3-030-46777-7_7.

Almeder, Robert. 1979. "Peirce on Meaning." *Synthese* 41 (1): 1–24.

Alspector-Kelly, Marc. 2001. "On Quine on Carnap on Ontology." *Philosophical Studies* 102 (1): 93–122.

Andersen, Fredrik, and Jonas R. Becker Arenhart. 2016. "Metaphysics Within Science: Against Radical Naturalism." *Metaphilosophy* 47 (2): 159–80.

Anderson, E. 2012. "Problem of Time in Quantum Gravity." *Annalen Der Physik* 524 (12): 757–86. <https://doi.org/10.1002/andp.201200147>.

Atmanspacher, Harald, Hartmann Römer, and Harald Walach. 2002. "Weak Quantum Theory: Complementarity and Entanglement in Physics and Beyond." *Foundations of Physics* 32 (3): 379–406.

Barad, Karen. 2003. "Posthumanist Performativity: Toward an Understanding of How Matter Comes to Matter." *Signs: Journal of Women in Culture and Society* 28 (3): 801–31.

———. 2007. *Meeting the Universe Halfway*. Durham: Duke University Press.

———. 2010. "Quantum Entanglements and Hauntological Relations of Inheritance: Dis/Continuities, SpaceTime Enfoldings, and Justice-to-Come." *Derrida Today* 3 (2): 240–68. <https://doi.org/10.3366/drt.2010.0206>.

———. 2011. "Erasers and Erasures: Pinch's Unfortunate 'Uncertainty Principle.'" *Social Studies of Science* 41 (3): 443–54. <https://doi.org/10.1177/0306312711406317>.

———. 2012a. "What Is the Measure of Nothingness." *Infinity, Virtuality, Justice* 100.

- . 2012b. “Nature’s Queer Performativity*.” *Kvinder, Køn & Forskning* 0 (1–2). <https://doi.org/10.7146/kkf.v0i1-2.28067>.
- . 2012c. “On Touching—the Inhuman That Therefore I Am.” *Differences* 23 (3): 206–23. <https://doi.org/10.1215/10407391-1892943>.
- . 2014. “Diffracting Diffraction: Cutting Together-Apart.” *Parallax* 20 (3): 168–87. <https://doi.org/10.1080/13534645.2014.927623>.
- . 2015. “TransMaterialities: Trans*/Matter/Realities and Queer Political Imaginings.” *GLQ: A Journal of Lesbian and Gay Studies* 21 (2–3): 387–422. <https://doi.org/10.1215/10642684-2843239>.
- Barnes, Elizabeth. 2014. “XV—Going Beyond the Fundamental: Feminism in Contemporary Metaphysics.” *Proceedings of the Aristotelian Society* 114 (3_pt_3): 335–51. <https://doi.org/10.1111/j.1467-9264.2014.00376.x>.
- Baron, Sam. 2020. “The Curious Case of Spacetime Emergence.” *Philosophical Studies* 177 (8): 2207–26. <https://doi.org/10.1007/s11098-019-01306-z>.
- Baytaş, Bekir, Eugenio Bianchi, and Nelson Yokomizo. 2018. “Gluing Polyhedra with Entanglement in Loop Quantum Gravity.” *Physical Review D* 98 (2): 026001.
- Bell, J. S. 2001. “The Theory of Local Beables.” In *John S. Bell on the Foundations of Quantum Mechanics*, edited by M. Bell, K. Gottfried, and M. Veltman, 50–60. Singapore: WORLD SCIENTIFIC.
- Bennett, Karen. 2016. “There Is No Special Problem with Metaphysics.” *Philosophical Studies* 173 (1): 21–37.
- Bianchi, Eugenio. 2017. “Spinfoam Gravity.” In *Loop Quantum Gravity*, edited by Abhay Ashtekar and Jorge Pullin, Volume 4:97–124. 100 Years of General Relativity. Singapore: World Scientific. https://doi.org/10.1142/9789813220003_0004.
- Bianchi, Eugenio, Pietro Doná, and Simone Speziale. 2011. “Polyhedra in Loop Quantum Gravity.” *Physical Review D* 83 (4): 044035.
- Bird, Alexander. 2007. *Nature’s Metaphysics: Laws and Properties*. Oxford: Oxford University Press.
- Blackburn, Simon. 2002. “Metaphysics.” In *The Blackwell Companion to Philosophy*, edited by Nicholas Bunnin and E. P. Tsui-James, 61–89. Oxford: Blackwell Publishing Ltd.
- Bloomfield, Paul. 2005. “Let’s Be Realistic about Serious Metaphysics.” *Synthese* 144 (1): 69–90.

Bohr, Niels. 1949. "Discussions with Einstein on Epistemological Problems in Atomic Physics." In *Albert Einstein, Philosopher–Scientist: The Library of Living Philosophers*, edited by Paul Arthur Schilpp, 7:201–41. Evanston: Open Court.

Boudry, Maarten, and Michael Vlerick. 2014. "Natural Selection Does Care about Truth." *International Studies in the Philosophy of Science* 28 (1): 65–77. <https://doi.org/10.1080/02698595.2014.915651>.

Boyer, Pascal. 2000. "Natural Epistemology or Evolved Metaphysics? Developmental Evidence for Early-Developed, Intuitive, Category-Specific, Incomplete, and Stubborn Metaphysical Presumptions." *Philosophical Psychology* 13 (3): 277–97. <https://doi.org/10.1080/09515080050128123>.

Bradley, Darren. 2017. "Carnap's Epistemological Critique of Metaphysics." *Synthese*, March. <https://doi.org/10.1007/s11229-017-1335-x>.

Brandon, Robert N., and Scott Carson. 1996. "The Indeterministic Character of Evolutionary Theory: No 'No Hidden Variables Proof' but No Room for Determinism Either." *Philosophy of Science* 63 (3): 315–37.

Bricmont, Jean. 2017. "The de Broglie – Bohm Theory as a Rational Completion of Quantum Mechanics,." *Canadian Journal of Physics* 96 (4): 379–90. <https://doi.org/10.1139/cjp-2017-0192>.

Bryant, Amanda. 2020a. "Keep the Chickens Cooped: The Epistemic Inadequacy of Free Range Metaphysics." *Synthese*, no. 197: 1867–87. <https://doi.org/10.1007/s11229-017-1398-8>.

———. 2020b. "NATURALISMS." *Think* 19 (56): 35–50. <https://doi.org/10.1017/S1477175620000196>.

———. 2020c. "Epistemic Infrastructure for a Scientific Metaphysics." *Grazer Philosophische Studien* 98 (1): 27–49. <https://doi.org/10.1163/18756735-000096>.

Bueno, Otávio. 2003. "Is It Possible to Nominalize Quantum Mechanics?" *Philosophy of Science* 70 (5): 1424–36. <https://doi.org/10.1086/377419>.

Butler, Judith. 1993. *Bodies That Matter: On the Discursive Limits of "Sex."* New York: Routledge.

Cameron, Ross P. 2010. "Quantification, Naturalness, and Ontology." In *New Waves in Metaphysics*, edited by Allan Hazlett, 8–26. London: Palgrave Macmillan UK. https://doi.org/10.1057/9780230297425_2.

———. 2020. "Truthmaking and Metametaphysics." In *The Routledge Handbook of Metametaphysics*, edited by Ricki Bliss and J.T.M. Miller, 233–44. Routledge.

- Canales, Jimena. 2015. *The Physicist and the Philosopher*. Princeton: Princeton University Press.
- Carnap, Rudolf. 1932. "Überwindung Der Metaphysik Durch Logische Analyse Der Sprache." *Erkenntnis* 2 (1): 219–41.
- . 1934. "On the Character of Philosophic Problems." *Philosophy of Science* 1 (1): 5–19.
- . (1934) 1937. *The Logical Syntax of Language*. London: Routledge & Kegan Paul Ltd.
- . 1942. *Introduction to Semantics*. Massachusetts: Harvard University Press.
- . 1950. "Empiricism, Semantics, and Ontology." *Revue Internationale de Philosophie* 4 (2): 20–40.
- . 1956. "Meaning and Synonymy in Natural Languages." In *Meaning and Necessity*, 2nd ed., 233–250. Chicago: Chicago University Press.
- . 1984. "On the Character of Philosophic Problems." *Philosophy of Science* 51 (1): 5–19.
- Chakravartty, Anjan. 2007. *A Metaphysics for Scientific Realism*. Cambridge University Press. <http://dx.doi.org/10.1017/CBO9780511487354>.
- Chakravartty, Anjan. 2013. "On the Prospects of Naturalized Metaphysics." In *Scientific Metaphysics*, 27–50. Oxford: Oxford University Press.
- . 2017. *Scientific Ontology: Integrating Naturalized Metaphysics and Voluntarist Epistemology*. New York: Oxford University Press.
- Chalmers, David. 2009. "Ontological Anti-Realism." In *Metametaphysics: New Essays on the Foundations of Ontology*, edited by David Chalmers, David Manley, and Ryan Wasserman, 77–129. Oxford: Oxford University Press.
- Clifton, Rob, and Hans Halvorson. 2001. "Entanglement and Open Systems in Algebraic Quantum Field Theory." *Studies in History and Philosophy of Science Part B: Studies in History and Philosophy of Modern Physics* 32 (1): 1–31. [https://doi.org/10.1016/S1355-2198\(00\)00033-2](https://doi.org/10.1016/S1355-2198(00)00033-2).
- Coleman, Rebecca. 2014. "Inventive Feminist Theory: Representation, Materiality and Intensive Time." *Women: A Cultural Review* 25 (1): 27–45. <https://doi.org/10.1080/09574042.2014.901098>.

Crasnow, Sharon. 2013. "Feminist Philosophy of Science: Values and Objectivity." *Philosophy Compass* 8 (4): 413–23. <https://doi.org/10.1111/phc3.12023>.

Creath, Richard. 1990. *Dear Carnap, Dear Van, the Quine-Carnap Correspondence and Other Material*. Berkeley: University of California Press.

Crowther, Karen, and Niels Linnemann. 2017. "Renormalizability, Fundamentality, and a Final Theory: The Role of UV-Completion in the Search for Quantum Gravity." *The British Journal for the Philosophy of Science* 70 (2): 377–406. <https://doi.org/10.1093/bjps/axx052>.

Darby, George. 2009. "Lewis's Worldmate Relation and the Apparent Failure of Humean Supervenience." *Dialectica* 63 (2): 195–204.

De Caro, Mario. 2010. "Varieties of Naturalism." In *The Waning of Materialism*, edited by Robert C. Koons and George Bealer. Oxford: Oxford University Press.

De Caro, Mario, and David Macarthur. 2004. "Introduction - the Nature of Naturalism." In *Naturalism in Question*. Cambridge, MA: Harvard University Press.

De Ridder, Jeroen. 2014. "Science and Scientism in Popular Science Writing." *Social Epistemology Review and Reply Collective* 3 (12).

Dieveney, Patrick. 2012. "In Defense of Quinean Ontological Naturalism." *Erkenntnis* 76 (2): 225–42.

Dolphijn, Rick, and Iris Van der Tuin. 2012. *New Materialism: Interviews & Cartographies*. New Metaphysics. Open Humanities Press. <http://dx.doi.org/10.3998/ohp.11515701.0001.001>.

Dorato, Mauro. 2013. "How to Combine and Not to Combine Physics and Metaphysics." In *EPSA11 Perspectives and Foundational Problems in Philosophy of Science*, edited by Vassilios Karakostas and Dennis Dieks, 295–305. Cham: Springer International Publishing.

Dorr, Cian. 2010. "Review of Every Thing Must Go: Metaphysics Naturalized, by James Ladyman and Don Ross." *Notre Dame Philosophical Reviews* June 16. <http://ndpr.nd.edu/review.cfm?id=19947>.

Draper, Paul. 2005. "God, Science, and Naturalism." In *The Oxford Handbook of Philosophy of Religion*, edited by William J. Wainwright. New York: Oxford University Press.

Dürr, Detlef, Sheldon Goldstein, and Nino Zanghi. 2018. "Quantum Motion on Shape Space and the Gauge Dependent Emergence of Dynamics and Probability

in Absolute Space and Time.” arXiv:1808.06844.
<https://arxiv.org/abs/1808.06844>.

Earman, John. 1993. “Underdetermination, Realism, and Reason.” *Midwest Studies In Philosophy* 18 (1): 19–38. <https://doi.org/10.1111/j.1475-4975.1993.tb00255.x>.

Eklund, Matti. 2012. “Multitude, Tolerance and Language-Transcendence.” *Synthese* 187 (3): 833–47. <https://doi.org/10.1007/s11229-011-9904-x>.

———. 2013. “Carnap’s Metaontology.” *Noûs* 47 (2): 229–49.

Eldridge, Michael. 2004. “Naturalism.” In *The Blackwell Guide to American Philosophy*, 52–71. Blackwell Publishing Ltd.

Esfeld, Michael. 2004. “Quantum Entanglement and a Metaphysics of Relations.” *Studies in History and Philosophy of Science Part B: Studies in History and Philosophy of Modern Physics* 35 (4): 601–17.

———. 2018. “Metaphysics of Science as Naturalized Metaphysics.” In *The Philosophy of Science. A Companion*, edited by Anouk Barberousse, Denis Bonnay, and Mikael Cozic, 142–70. Oxford University Press.

———. 2019. “Against the Disappearance of Spacetime in Quantum Gravity.” *Synthese*, May. <https://doi.org/10.1007/s11229-019-02168-y>.

———. 2020. “A Proposal for a Minimalist Ontology.” *Synthese* 197 (5): 1889–1905. <https://doi.org/10.1007/s11229-017-1426-8>.

Esfeld, Michael, and Dirk-Andre Deckert. 2017. *A Minimalist Ontology of the Natural World*. New York: Routledge.

Fairchild, Nikki, and Carol Taylor. 2019. “Barad, Karen.” In *SAGE Research Methods Foundations*, edited by P. Atkinson, S. Delamont, J. W. Sakshaug, and R. A. Williams. <https://dx.doi.org/10.4135/9781526421036808757>.

Faye, Jan. 2016. *Experience and Beyond*. Palgrave Macmillan.

———. 2019. “Copenhagen Interpretation of Quantum Mechanics.” In *The Stanford Encyclopedia of Philosophy*, edited by Edward N. Zalta. Vol. Winter 2019. <https://plato.stanford.edu/archives/fall2014/entries/qm-copenhagen/>.

Faye, Jan, and Rasmus Jaksland. 2021. “Barad, Bohr, and Quantum Mechanics.” *Synthese*, April. <https://doi.org/10.1007/s11229-021-03160-1>.

Feigl, Herbert. 1950. “Existential Hypotheses. Realistic versus Phenomenalistic Interpretations.” *Philosophy of Science* 17 (1): 35–62.

———. (1963) 1981. "Physicalism, Unity of Science and the Foundations of Psychology." In *Inquiries and Provocations: Selected Writings 1929–1974*, edited by Herbert Feigl and Robert S. Cohen, 302–41. Dordrecht: Springer Netherlands. https://doi.org/10.1007/978-94-010-9426-9_17.

Field, Hartry. 1980. *Science Without Numbers*. Vol. 17. Princeton University Press.

Filk, Thomas, and Hartmann Römer. 2011. "Generalized Quantum Theory: Overview and Latest Developments." *Axiomathes* 21 (2): 211–20.

Fine, Arthur. 1986. "Unnatural Attitudes: Realist and Instrumentalist Attachments to Science." *Mind* 95 (378): 149–79.

———. 2018. "Motives for Research." *Spontaneous Generations: A Journal for the History and Philosophy of Science* 9 (1): 42–45.

Flocke, Vera. 2018. "Carnap's Noncognitivism about Ontology." *Noûs* 0 (0). <https://doi.org/10.1111/nous.12267>.

Forster, Malcolm, and Elliott Sober. 1994. "How to Tell When Simpler, More Unified, or Less Ad Hoc Theories Will Provide More Accurate Predictions." *The British Journal for the Philosophy of Science* 45 (1): 1–35.

Fox, Nick J., and Pam Alldred. 2015. "New Materialist Social Inquiry: Designs, Methods and the Research-Assemblage." *International Journal of Social Research Methodology* 18 (4): 399–414. <https://doi.org/10.1080/13645579.2014.921458>.

Fraassen, Bas C. van. 2002. *The Empirical Stance*. New Haven: Yale University Press.

Freitas, Elizabeth de. 2016. "Karen Barad." In *Alternative Theoretical Frameworks for Mathematics Education Research: Theory Meets Data*, edited by Elizabeth de Freitas and Margaret Walshaw, 149–73. Cham: Springer International Publishing. https://doi.org/10.1007/978-3-319-33961-0_7.

French, Steven. 1998. "On the Whithering Away of Physical Objects." In *Interpreting Bodies*, edited by Elena Castellani, 93–113. Princeton University Press.

———. 2011. "Metaphysical Underdetermination: Why Worry?" *Synthese* 180 (2): 205–21. <https://doi.org/10.1007/s11229-009-9598-5>.

———. 2014. *The Structure of the World: Metaphysics and Representation*. Oxford: Oxford University Press.

———. 2018. “Toying with the Toolbox: How Metaphysics Can Still Make a Contribution.” *Journal for General Philosophy of Science* 49 (2): 211–30. <https://doi.org/10.1007/s10838-018-9401-8>.

French, Steven, and Kerry McKenzie. 2012. “Thinking Outside the Toolbox: Towards a More Productive Engagement Between Metaphysics and Philosophy of Physics.” *European Journal of Analytic Philosophy* 8 (1): 42–59.

———. 2016. “Rethinking Outside the Toolbox: Reflecting Again on the Relationship between Philosophy of Science and Metaphysics.” In *Metaphysics in Contemporary Physics*, edited by Thomasz Bigaj and Christian Wüthrich, 25–54. Leiden: Brill | Rodopi. https://doi.org/10.1163/9789004310827_003.

Friedman, Michael. 1983. *Foundations of Space-Time Theories*. Princeton: Princeton University Press.

———. 1991. “The Re-Evaluation of Logical Positivism.” *The Journal of Philosophy* 88 (10): 505–19.

Gamble, Christopher N., Joshua S. Hanan, and Thomas Nail. 2019. “WHAT IS NEW MATERIALISM?” *Angelaki* 24 (6): 111–34. <https://doi.org/10.1080/0969725X.2019.1684704>.

Gava, Gabriele. 2019. “Peirce and Methodological Naturalism.” In *Responses to Naturalism: Critical Perspectives From Idealism and Pragmatism*, edited by Paul Giladi, 208–29. Routledge.

Gelman, Susan A., and Kristan A. Marchak. 2019. “Do Our Intuitions Mislead Us? The Role of Human Bias in Scientific Inquiry.” In *What Is Scientific Knowledge?*, edited by Kevin McCain and Kostas Kampourakis, 179–94. Routledge.

Gibson, Roger F. 1992. “THE KEY TO INTERPRETING QUINE.” *The Southern Journal of Philosophy* 30 (4): 17–30. <https://doi.org/10.1111/j.2041-6962.1992.tb00644.x>.

Ginev, Dimitri. 2016. *Hermeneutic Realism: Reality Within Scientific Inquiry*. Springer International Publishing.

Gisin, Nicolas. 2021. “Indeterminism in Physics and Intuitionistic Mathematics.” *Synthese*, September. <https://doi.org/10.1007/s11229-021-03378-z>.

Glymour, Bruce. 2001. “Selection, Indeterminism, and Evolutionary Theory.” *Philosophy of Science* 68 (4): 518–35. <https://doi.org/10.1086/392940>.

Goldstein, Sheldon, and Stefan Teufel. 2001. “Quantum Spacetime without Observers: Ontological Clarity and the Conceptual Foundations of Quantum Gravity.” In *Physics Meets Philosophy at the Planck Scale: Contemporary Theories*

in *Quantum Gravity*, edited by Craig Callender and Nick Huggett, 275–89. Cambridge: Cambridge University Press. <https://doi.org/10.1017/CBO9780511612909.013>.

Götschel, Helene. 2011. "The Entanglement of Gender and Physics: Human Actors, Work Place Cultures, and Knowledge Production." *Science & Technology Studies* 24 (1): 66–80.

Graves, Leslie, Barbara L. Horan, and Alex Rosenberg. 1999. "Is Indeterminism the Source of the Statistical Character of Evolutionary Theory?" *Philosophy of Science* 66 (1): 140–57. <https://doi.org/10.1086/392680>.

Griffiths, Paul E., and John S. Wilkins. 2015. "Crossing the Milvian Bridge: When Do Evolutionary Explanations of Belief Debunk Belief?" In *Darwin in the Twenty-First Century: Nature, Humanity, and God*, edited by Phillip R. Sloan, Gerald McKenny, and Kathleen Eggleston, 201–31. University of Notre Dame Press.

Haack, Susan. 1993. "The Two Faces of Quine's Naturalism." *Synthese* 94 (3): 335–56. <https://doi.org/10.1007/BF01064484>.

Hagar, Amit, and Meir Hemmo. 2013. "The Primacy of Geometry." *Studies in History and Philosophy of Science Part B: Studies in History and Philosophy of Modern Physics* 44 (3): 357–64. <https://doi.org/10.1016/j.shpsb.2013.01.003>.

Häggqvist, Sören. 2009. "A Model for Thought Experiments." *Canadian Journal of Philosophy* 39 (1): 55–76. <https://doi.org/10.1353/cjp.0.0040>.

Halvorson, Hans. 2016. "Why Methodological Naturalism." In *The Blackwell Companion to Naturalism*, edited by Kelly James Clark, 136–49. Hoboken: John Wiley & Sons.

Haraway, Donna. 1988. "Situated Knowledges: The Science Question in Feminism and the Privilege of Partial Perspective." *Feminist Studies* 14 (3): 575–99. <https://doi.org/10.2307/3178066>.

———. 1992. "The Promises of Monsters: A Regenerative Politics for Inappropriate/d Others." In *Cultural Studies*, edited by Lawrence Grossberg, Cary Nelson, and Paula A. Treichler, 295–337. New York.

———. 1997. *Modest-Witness@Second-Millennium.FemaleMan-Meets-OncoMouse: Feminism and Technoscience*. Cultural Studies. Science Studies. New York: Routledge.

Harding, Sandra. 1986. *The Science Question in Feminism*. ACLS Humanities E-Book. Cornell University Press.

———. 1991. *Whose Science? Whose Knowledge?* Ithaca: Cornell University Press.

Harrell, Maralee. 2016. "On the Possibility of Feminist Philosophy of Physics." In *Meta-Philosophical Reflection on Feminist Philosophies of Science*, edited by Maria Cristina Amoretti and Nicla Vassallo, 15–34. https://doi.org/10.1007/978-3-319-26348-9_2.

Haug, Matthew C. 2014. *Philosophical Methodology: The Armchair or the Laboratory?* New York: Routledge.

Haukioja, Jussi. 2020. "Metaphysical Realism and Anti-Realism." In *The Routledge Handbook of Metametaphysics*, edited by Ricki Bliss and J.T.M. Miller, 61–70. Routledge.

Hawley, Katherine. 2006. "Science as a Guide to Metaphysics?" *Synthese* 149 (3): 451–70.

———. 2018. "Social Science as a Guide to Social Metaphysics?" *Journal for General Philosophy of Science* 49 (2): 187–98. <https://doi.org/10.1007/s10838-017-9389-5>.

Hedrich, Reiner. 2007. "The Internal and External Problems of String Theory: A Philosophical View." *Journal for General Philosophy of Science / Zeitschrift Für Allgemeine Wissenschaftstheorie* 38 (2): 261–78.

Hendry, Robin Findlay. 2001. "Are Realism and Instrumentalism Methodologically Indifferent?" *Philosophy of Science* 68 (S3): S25–37. <https://doi.org/10.1086/392895>.

Henry, John. 2019. "Newton and Action at a Distance." In *The Oxford Handbook of Newton*, edited by Eric Schliesser and Chris Smeenk, 1–34. Oxford: Oxford University Press.

Hietanen, Johan, Petri Turunen, Ilmari Hirvonen, Janne Karisto, Ilkka Pättiniemi, and Henrik Saarinen. 2020. "How Not to Criticise Scientism." *Metaphilosophy* 51 (4): 522–47. <https://doi.org/10.1111/meta.12443>.

Hinton, Peta. 2017. "A Sociality of Death: Towards a New Materialist Politics and Ethics of Life Itself." In *What If Culture Was Nature All Along?*, edited by Vicki Kirby, 223–47. Edinburgh University Press. www.jstor.org/stable/10.3366/j.ctt1g050d1.15.

Hirsch, Eli. 2002. "QUANTIFIER VARIANCE AND REALISM." *Philosophical Issues* 12 (1): 51–73. <https://doi.org/10.1111/j.1758-2237.2002.tb00061.x>.

———. 2009. "Ontology and Alternative Languages." In *Metametaphysics: New Essays on the Foundations of Ontology*, edited by David Chalmers, David Manley, and Ryan Wasserman, 231–58. Oxford University Press.

Hofweber, Thomas. 2016a. "Carnap's Big Idea." In *Ontology after Carnap*. Oxford: Oxford University Press. <http://www.oxfordscholarship.com/view/10.1093/acprof:oso/9780199661985.001.0001/acprof-9780199661985-chapter-2>.

———. 2016b. *Ontology and the Ambitions of Metaphysics*. Oxford University Press UK.

———. 2016c. "How Metaphysics Is Special: Comments on Bennett." *Philosophical Studies* 173 (1): 39–48. <https://doi.org/10.1007/s11098-014-0435-4>.

———. 2020. "Is Metaphysics Special?" In *The Routledge Handbook of Metametaphysics*, edited by Ricki Bliss and J.T.M. Miller, 421–31. Routledge.

Hollin, Gregory, Isla Forsyth, Eva Giraud, and Tracey Potts. 2017. "(Dis)Entangling Barad: Materialisms and Ethics." *Social Studies of Science* 47 (6): 918–41. <https://doi.org/10.1177/0306312717728344>.

Hořava, Petr. 2009. "Quantum Gravity at a Lifshitz Point." *Physical Review D* 79 (8): 084008. <https://doi.org/10.1103/PhysRevD.79.084008>.

Hossenfelder, S. 2018. *Lost in Math: How Beauty Leads Physics Astray*. Basic Books.

Hudson, Hud. 2016. "Non-Naturalistic Metaphysics." In *The Blackwell Companion to Naturalism*, edited by Kelly James Clark, 136–49. Hoboken: John Wiley & Sons.

Huemer, Michael. 2009. "WHEN IS PARSIMONY A VIRTUE?" *The Philosophical Quarterly* 59 (235): 216–36. <https://doi.org/10.1111/j.1467-9213.2008.569.x>.

Huggett, Nick, and Christian Wüthrich. 2013. "Emergent Spacetime and Empirical (in)Coherence." *Studies in History and Philosophy of Science Part B: Studies in History and Philosophy of Modern Physics* 44 (3): 276–85.

Humphreys, Paul. 2013. "Scientific Ontology and Speculative Ontology." In *Scientific Metaphysics*, edited by Don Ross, James Ladyman, and Harold Kincaid, 51–78. Oxford: Oxford University Press.

Hylton, Peter. 1994. "Quine's Naturalism." *Midwest Studies In Philosophy* 19 (1): 261–82. <https://doi.org/10.1111/j.1475-4975.1994.tb00289.x>.

———. 2014. “Quine’s Naturalism Revisited.” In *A Companion to W.V.O. Quine*, edited by Gilbert Harman and Ernest LePore, 148–62. John Wiley & Sons, Ltd.

Inwagen, Peter van. 2015. *Metaphysics*. Boulder: Westview Press.

———. 2020. “The Neo-Carnapians.” *Synthese* 197 (1): 7–32. <https://doi.org/10.1007/s11229-016-1110-4>.

Isham, C. J. 1993. “Canonical Quantum Gravity and the Problem of Time.” In *Integrable Systems, Quantum Groups, and Quantum Field Theories*, edited by L. A. Ibort and M. A. Rodríguez, 157–287. Dordrecht: Springer Netherlands. https://doi.org/10.1007/978-94-011-1980-1_6.

Ismael, Jenann, and Jonathan Schaffer. 2016. “Quantum Holism: Nonseparability as Common Ground.” *Synthese*. <https://doi.org/10.1007/s11229-016-1201-2>.

Jacobs, Jon. 2019. “Naturalism.” In *The Internet Encyclopedia of Philosophy*. <http://www.iep.utm.edu/naturali/>.

Jaksland, Rasmus. 2017. “A Dilemma for Empirical Realism: Metaphysical Realism or Instrumentalism.” *Philosophia* 45 (3): 1195–1205. <https://doi.org/10.1007/s11406-017-9828-x>.

———. 2020a. “Old Problems for Neo-Positivist Naturalized Metaphysics.” *European Journal for Philosophy of Science* 10 (2): 16. <https://doi.org/10.1007/s13194-020-00282-0>.

———. 2020b. “Norms of Testimony in Broad Interdisciplinarity: The Case of Quantum Mechanics in Critical Theory.” *Journal for General Philosophy of Science*, October. <https://doi.org/10.1007/s10838-020-09523-5>.

———. 2021a. “Entanglement as the World-Making Relation: Distance from Entanglement.” *Synthese* 198: 9661–93. <https://doi.org/10.1007/s11229-020-02671-7>.

———. 2021b. “Non-Supernaturalism: Linguistic Convention, Metaphysical Claim, or Empirical Matter of Fact?” *Philosophia* 49 (1): 299–314. <https://doi.org/10.1007/s11406-020-00251-0>.

———. 2021c. “An Apology for Conflicts between Metaphysics and Science in Naturalized Metaphysics.” *European Journal for Philosophy of Science* 11 (3): 74. <https://doi.org/10.1007/s13194-021-00390-5>.

Jenkins, C. S. I. 2013. “Naturalistic Challenges to the A Priori.” In *The A Priori in Philosophy*. Oxford: Oxford University Press. <https://doi.org/10.1093/acprof:oso/9780199695331.003.0013>.

———. 2014. "Serious Verbal Disputes: Ontology, Metaontology, and Analyticity." *Journal of Philosophy* 111 (9–10).

Jones, Roger. 1991. "Realism about What?" *Philosophy of Science* 58 (2): 185–202.

Keil, Geert. 2008. "Naturalism." In *The Routledge Companion to Twentieth-Century Philosophy*, edited by Dermot Moran. London: Routledge.

Keller, E.F. 1995. *Reflections on Gender and Science*. Yale University Press.

Kincaid, Harold. 2013. "Introduction: Pursuing a Naturalist Metaphysics." In *Scientific Metaphysics*, 1–26. Oxford: Oxford University Press.

Kirby, Vicki. 1997. *Telling Flesh: The Substance of the Corporeal*. New York: Routledge. <https://books.google.no/books?id=i9x78DN0oZkC>.

———. 2017. "Matter out of Place: 'New Materialism' in Review." In *What If Culture Was Nature All Along?*, edited by Vicki Kirby, 1–25. Edinburgh University Press. <https://www.cambridge.org/core/books/what-if-culture-was-nature-all-along/matter-out-of-place-new-materialism-in-review/C3E0997B2F8BF7D85046AE231A501ADC>.

Knowles, Jonathan. 2017. "Global Expressivism and the Flight from Metaphysics." *Synthese* 194 (12): 4781–97.

Kornblith, Hilary. 1994. "Naturalism: Both Metaphysical and Epistemological." *Midwest Studies in Philosophy* 19 (1): 39–52.

———. 2016. "Philosophical Naturalism." In *The Oxford Handbook of Philosophical Methodology*, edited by Herman Cappelen, Tamar Szabó Gendler, and John Hawthorne. Oxford: Oxford University Press.

Kraut, Robert. 2016. "Three Carnaps on Ontology." In *Ontology after Carnap*, edited by Stephan Blatti and Sandra Lapointe. Oxford: Oxford University Press. <http://www.oxfordscholarship.com/view/10.1093/acprof:oso/9780199661985.001.0001/acprof-9780199661985-chapter-3>.

———. 2020. "Rudolf Carnap." In *The Routledge Handbook of Metametaphysics*, edited by Ricki Bliss and J.T.M. Miller, 32–48. Routledge.

Kubricht, James R., Keith J. Holyoak, and Hongjing Lu. 2017. "Intuitive Physics: Current Research and Controversies." *Trends in Cognitive Sciences* 21 (10): 749–59. <https://doi.org/10.1016/j.tics.2017.06.002>.

Kuhn, Thomas S. 1970. *The Structure of Scientific Revolutions*. Second Edition. Chicago: The University of Chicago Press.

Ladyman, James. 2007. "Does Physics Answer Metaphysical Questions?" *Royal Institute of Philosophy Supplements* 61: 179–201.

———. 2012. "Science, Metaphysics and Method." *Philosophical Studies* 160 (1): 31–51.

———. 2017. "An Apology for Naturalized Metaphysics." In *Metaphysics and the Philosophy of Science*, edited by Matthew Slater and Zanja Yudell, 141–61. New York: Oxford University Press. <http://www.oxfordscholarship.com/10.1093/acprof:oso/9780199363209.001.001/acprof-9780199363209-chapter-8>.

———. 2018. "Scientism with a Humane Face." In *Scientism*, edited by Jeroen De Ridder, Rik Peels, and René van Woudenberg. New York: Oxford University Press. <https://doi.org/10.1093/oso/9780190462758.003.0005>.

Ladyman, James, and Don Ross. 2007. *Every Thing Must Go: Metaphysics Naturalized*. Oxford: Oxford University Press.

Lam, Vincent. 2013. "The Entanglement Structure of Quantum Field Systems." *International Studies in the Philosophy of Science* 27 (1): 59–72. <https://doi.org/10.1080/02698595.2013.783976>.

———. 2016. "Quantum Structure and Spacetime." In *Metaphysics in Contemporary Physics*, edited by Thomas Bigaj and Christian Wüthrich, 81–99. Leiden: Brill | Rodopi. https://doi.org/10.1163/9789004310827_005.

Lam, Vincent, and Michael Esfeld. 2013. "A Dilemma for the Emergence of Spacetime in Canonical Quantum Gravity." *Studies in History and Philosophy of Science Part B: Studies in History and Philosophy of Modern Physics* 44 (3): 286–93.

Lam, Vincent, and Christian Wüthrich. 2018. "Spacetime Is as Spacetime Does." *Studies in History and Philosophy of Science Part B: Studies in History and Philosophy of Modern Physics*, June. <https://doi.org/10.1016/j.shpsb.2018.04.003>.

———. 2020. "Spacetime Functionalism from a Realist Perspective." *Synthese*, April. <https://doi.org/10.1007/s11229-020-02642-y>.

Laudan, Larry. 1981. "A Confutation of Convergent Realism." *Philosophy of Science* 48 (1): 19–49.

Le Bihan, Baptiste. 2018. "Space Emergence in Contemporary Physics: Why We Do Not Need Fundamentality, Layers of Reality and Emergence." *Disputatio* 10 (49): 71–95. <https://doi.org/10.2478/disp-2018-0004>.

- . 2019. "Spacetime Emergence in Quantum Gravity: Functionalism and the Hard Problem." *Synthese*, October. <https://doi.org/10.1007/s11229-019-02449-6>.
- Le Bihan, Baptiste, and Adrien Barton. 2018. "Analytic Metaphysics Versus Naturalized Metaphysics: The Relevance of Applied Ontology." *Erkenntnis*, December. <https://doi.org/10.1007/s10670-018-0091-8>.
- Lewis, David. 1986a. *On the Plurality of Worlds*. 97. Malden, MA: Blackwell Publishers.
- . 1986b. *Philosophical Papers Volume II*. New York: Oxford University Press.
- . 1994. "Humean Supervenience Debugged." *Mind* 103 (412): 473–90.
- Loewer, Barry. 1996. "Humean Supervenience." *Philosophical Topics* 24 (1): 101–27.
- Longino, Helen. 1987. "Can There Be A Feminist Science?" *Hypatia* 2 (3): 51–64. <https://doi.org/10.1111/j.1527-2001.1987.tb01341.x>.
- . 1990. *Science as Social Knowledge*. Princeton University Press.
- Lowe, E. J. 1998. *The Possibility of Metaphysics: Substance, Identity, and Time*. Oxford University Press.
- . 2014. "Metaphysical Knowledge." In *Philosophical Methodology: The Armchair or the Laboratory?*, edited by Matthew C. Haug, 126–44. Routledge.
- Lyre, Holger. 2011. "Is Structural Underdetermination Possible?" *Synthese* 180 (2): 235–47. <https://doi.org/10.1007/s11229-009-9603-z>.
- Maclaurin, James, and Heather Dyke. 2012. "What Is Analytic Metaphysics For?" *Australasian Journal of Philosophy* 90 (2): 291–306. <https://doi.org/10.1080/00048402.2011.587439>.
- Maddy, Penelope. 1992. "Indispensability and Practice." *The Journal of Philosophy* 89 (6): 275–89. <https://doi.org/10.2307/2026712>.
- Mahr, J.B., and Gergely Csibra. 2022. "A Short History of Theories of Intuitive Theories." In *A Life in Cognition*, edited by Judit Gervain, Gergely Csibra, and Kristóf Kovács. Springer.
- Malament, David. 1982. "Book Review: Science without Numbers by Hartry H. Field." *Journal of Philosophy* 79 (9).

- Manley, David. 2009. "Introduction : A Guided Tour of Metametaphysics." In *Metametaphysics: New Essays on the Foundations of Ontology*, edited by David Chalmers, David Manley, and Ryan Wasserman, 1--37. Oxford University Press.
- Maudlin, Tim. 2007a. "Completeness, Supervenience and Ontology." *Journal of Physics A: Mathematical and Theoretical* 40 (12): 3151.
- . 2007b. *The Metaphysics Within Physics*. Oxford: Oxford University Press.
- McKenzie, Kerry. 2020. "A Curse on Both Houses: Naturalistic Versus A Priori Metaphysics and the Problem of Progress." *Res Philosophica* 97 (1): 1–29.
- Melnyk, Andrew. 2013. "Can Metaphysics Be Naturalized? And If So, How?" In *Scientific Metaphysics*. Oxford: Oxford University Press.
- Mikkola, Mari. 2015. "Doing Ontology and Doing Justice: What Feminist Philosophy Can Teach Us About Meta-Metaphysics." *Inquiry* 58 (7–8): 780–805. <https://doi.org/10.1080/0020174X.2015.1083469>.
- . 2017. "On the Apparent Antagonism between Feminist and Mainstream Metaphysics." *Philosophical Studies* 174 (10): 2435–48. <https://doi.org/10.1007/s11098-016-0732-1>.
- Miller, Elizabeth. 2014. "Quantum Entanglement, Bohmian Mechanics, and Humean Supervenience." *Australasian Journal of Philosophy* 92 (3): 567–83.
- Misak, C.J. 1995. *Verificationism: Its History and Prospects*. Philosophical Issues in Science. Routledge.
- Morganti, Matteo. 2011. "Is There a Compelling Argument for Ontic Structural Realism?" *Philosophy of Science* 78 (5): 1165–76. <https://doi.org/10.1086/662258>.
- . 2013. *Combining Science and Metaphysics*. Palgrave Macmillan.
- . 2016. "Naturalism and Realism in Philosophy of Science." In *The Blackwell Companion to Naturalism*, edited by Kelly James Clark, 75–90. Hoboken: John Wiley & Sons.
- Morganti, Matteo, and Tuomas E. Tahko. 2017. "Moderately Naturalistic Metaphysics." *Synthese* 194 (7): 2557–80. <https://doi.org/10.1007/s11229-016-1068-2>.
- Morrison, Margaret. 1990. "Unification, Realism and Inference." *The British Journal for the Philosophy of Science* 41 (3): 305–32.

- Myrvold, Wayne C. 2003. "A Bayesian Account of the Virtue of Unification." *Philosophy of Science* 70 (2): 399–423. <https://doi.org/10.1086/375475>.
- Nelson, Lynn Hankinson. 1990. *Who Knows: From Quine to a Feminist Empiricism*. Philadelphia: Temple University Press.
- . 1995. "The Very Idea of Feminist Epistemology." *Hypatia* 10 (3): 31–49. <https://doi.org/10.1111/j.1527-2001.1995.tb00736.x>.
- . 2002. "Feminist Philosophy of Science." Edited by Peter Machamer and Michael Silberstein. *The Blackwell Guide to the Philosophy of Science*, 312.
- Ney, Alyssa. 2012. "Neo-Positivist Metaphysics." *Philosophical Studies* 160 (1): 53–78.
- . 2019. "Are the Questions of Metaphysics More Fundamental Than Those of Science?" *Philosophy and Phenomenological Research* 0 (0). <https://doi.org/10.1111/phpr.12571>.
- Nolan, Daniel. 2015. "The A Posteriori Armchair." *Australasian Journal of Philosophy* 93 (2): 211–31. <https://doi.org/10.1080/00048402.2014.961165>.
- . 2016. "Method in Analytic Metaphysics." In *The Oxford Handbook of Philosophical Methodology*, edited by Herman Cappelen, Tamar Szabó Gendler, and John Hawthorne, 159–78. Oxford University Press Oxford.
- Norton, Joshua. 2020. "Incubating a Future Metaphysics: Quantum Gravity." *Synthese* 197 (5): 1961–82. <https://doi.org/10.1007/s11229-017-1473-1>.
- Oriti, Daniele, ed. 2009. *Approaches to Quantum Gravity: Toward a New Understanding of Space, Time and Matter*. Cambridge: Cambridge University Press. <https://doi.org/10.1017/CBO9780511575549>.
- O'Shea, James R. 2010. "Normativity and Scientific Naturalism in Sellars' 'Janus-Faced' Space of Reasons." *International Journal of Philosophical Studies* 18 (3): 459–71. <https://doi.org/10.1080/09672559.2010.494436>.
- Otto, Rudolf. 1907. *Naturalism and Religion*. Williams & Norgate.
- Papineau, David. 2007. "Naturalist Theories of Meaning." In *The Oxford Handbook of Philosophy of Language*, edited by Ernest Lepore and Barry C. Smith, 175--188. Oxford University Press.
- . 2014. "The Poverty of Conceptual Analysis." In *Philosophical Methodology: The Armchair or the Laboratory?*, edited by Matthew C. Haug, 166–94. Routledge.

———. 2021. “Naturalism.” In *Stanford Encyclopedia of Philosophy*, edited by Edward N. Zalta. Vol. Summer 2021. <https://plato.stanford.edu/archives/sum2021/entries/naturalism/>.

Papoulias, Constantina, and Felicity Callard. 2010. “Biology’s Gift: Interrogating the Turn to Affect.” *Body & Society* 16 (1): 29–56. <https://doi.org/10.1177/1357034X09355231>.

Passinsky, Asya. 2019. “Finean Feminist Metaphysics.” *Inquiry*, September, 1–18. <https://doi.org/10.1080/0020174X.2019.1669984>.

Paul, Laurie A. 2012. “Metaphysics as Modeling: The Handmaiden’s Tale.” *Philosophical Studies* 160 (1): 1–29.

Peels, Rik. 2017a. “The Fundamental Argument against Scientism.” In , edited by Maarten Boudry and Massimo Pigliucci, 165–84. University of Chicago Press. <https://doi.org/10.7208/9780226498287-010>.

———. 2017b. “Ten Reasons to Embrace Scientism.” *Studies in History and Philosophy of Science Part A* 63 (June): 11–21. <https://doi.org/10.1016/j.shpsa.2017.04.001>.

———. 2020. “Should We Accept Scientism? The Argument from Self-Referential Incoherence.” In *What Is Scientific Knowledge?*, edited by Kevin McCain and Kostas Kampourakis, 274–87. New York: Routledge.

Penrose, Roger. 1971. “Angular Momentum: An Approach to Combinatorial Spacetime.” In *Quantum Theory and Beyond*, edited by T. Bastin, 151–80. Cambridge: Cambridge University Press.

Pettit, Philip. 1992. “The Nature of Naturalism - II.” *Proceedings of the Aristotelian Society, Supplementary Volumes* 66 (January): 245–66.

Pinch, Trevor. 2011. “Karen Barad, Quantum Mechanics, and the Paradox of Mutual Exclusivity.” *Social Studies of Science* 41 (3): 431–41.

Pitowsky, Itamar. 2006. “On the Definition of Equilibrium.” *Studies in History and Philosophy of Science Part B: Studies in History and Philosophy of Modern Physics* 37 (3): 431–38. <https://doi.org/10.1016/j.shpsb.2006.03.001>.

Plunkett, David. 2015. “Which Concepts Should We Use?: Metalinguistic Negotiations and The Methodology of Philosophy.” *Inquiry* 58 (7–8): 828–74.

Poidevin, Robin Le. 2009. “What Is Metaphysics?” In *The Routledge Companion to Metaphysics*, edited by Robin Le Poidevin, Peter Simons, Andrew McGonigal, and Ross P. Cameron, xviii–xxii. Routledge. <https://doi.org/10.4324/9780203879306>.

- Price, Huw. 2007. "Quining Naturalism." *The Journal of Philosophy* 104 (8): 375–402.
- . 2009. "Metaphysics after Carnap: The Ghost Who Walks." In *Metametaphysics: New Essays on the Foundations of Ontology*, edited by David Chalmers, David Manley, and Ryan Wasserman, 320–46. Oxford: Oxford University Press.
- . 2013. "Prospects for Global Expressivism." In *Expressivism, Pragmatism and Representationalism*, 147–94. Cambridge: Cambridge University Press.
- Psillos, Stathis. 1999. *Scientific Realism: How Science Tracks Truth*. London: Routledge.
- . 2011. "Choosing the Realist Framework." *Synthese* 180 (2): 301–16.
- Putnam, Hilary. 1973. "Explanation and Reference." In *Conceptual Change*, edited by Glenn Pearce and Patrick Maynard, 199–221. Dordrecht: Springer Netherlands. https://doi.org/10.1007/978-94-010-2548-5_11.
- . 1975. "What Is Mathematical Truth?" *Historia Mathematica* 2 (4): 529–33.
- Putnam, Hilary. 1979. "What Is Mathematical Truth?" In *Mathematics, Matter and Method*, 60–78. Philosophical Papers Volume 1. Cambridge: Cambridge University Press.
- Putnam, Hilary. 1995. "Pragmatism." *Proceedings of the Aristotelian Society* 95: 291–306.
- . 2004a. *Ethics without Ontology*. Cambridge, Mass: Harvard University Press.
- . 2004b. "The Content and Appeal of 'Naturalism.'" In *Naturalism in Question*, edited by Mario De Caro and David Macarthur, 59–70. Cambridge, MA: Harvard University Press.
- Quine, Willard van Orman. 1948. "On What There Is." *Review of Metaphysics* 2 (5): 21–36.
- . 1969a. "Epistemology Naturalized." In *Ontological Relativity and Other Essays*. New York: Columbia University Press.
- . 1969b. "Natural Kinds." In *Ontological Relativity and Other Essays*, 114–38. New York: Columbia University Press.
- . 1981. *Theories and Things*. Cambridge, MA: Harvard University Press.

- Raley, Yvonne. 2005. "ONTOLOGICAL NATURALISM." *Pacific Philosophical Quarterly* 86 (2): 284–94. <https://doi.org/10.1111/j.1468-0114.2005.00227.x>.
- Ray, Christophe de. 2020. "An Evolutionary Sceptical Challenge to Scientific Realism." *Erkenntnis*, March. <https://doi.org/10.1007/s10670-020-00226-3>.
- Rea, Michael C. 2002. *World Without Design: The Ontological Consequences of Naturalism*. Oxford: Oxford University Press.
- Redhead, Michael. 1995. "More Ado about Nothing." *Foundations of Physics* 25 (1): 123–37. <https://doi.org/10.1007/BF02054660>.
- Ribeiro, Cláudia. 2015. "The Complementarity of Science and Metaphysics." *Philosophica* 90.
- Richardson, Alan W. 2003. "Logical Empiricism, American Pragmatism, and the Fate of Scientific Philosophy in North America." In *Logical Empiricism in North America*, edited by GARY L. HARDCASTLE, ALAN W. RICHARDSON, C. KENNETH WATERS, and HERBERT FEIGL, NED-New edition, 18:1–24. University of Minnesota Press. <http://www.jstor.org/stable/10.5749/j.ctttvvrh.4>.
- Richardson, Sarah S. 2010. "Feminist Philosophy of Science: History, Contributions, and Challenges." *Synthese* 177 (3): 337–62. <https://doi.org/10.1007/s11229-010-9791-6>.
- Robus, Olin M. 2015. "Does Science License Metaphysics?" *Philosophy of Science* 82 (5): 845–55.
- Roland, Jeffrey W. 2013. "On Naturalism in Quinian Tradition." In *Philosophical Methodology: The Armchair or the Laboratory?*, edited by Matthew C. Haug, 43–61. Abingdon: Routledge.
- Rosen, Gideon. 2014. "Quine and the Revival of Metaphysics." In *A Companion to W.V.O. Quine*, edited by Gilbert Harman and Ernest LePore, 552–70. John Wiley & Sons, Ltd. <http://dx.doi.org/10.1002/9781118607992.ch26>.
- Ross, Don. 2016. "Vikings or Normans? The Radicalism of Naturalized Metaphysics." *Metaphysica* 17 (2): 213. <https://doi.org/10.1515/mp-2016-0018>.
- Rouse, Joseph. 2004. "Barad's Feminist Naturalism." *Hypatia* 19 (1): 142–61.
- Rovelli, Carlo. 2008. "Loop Quantum Gravity." *Living Reviews in Relativity* 11 (1): 5. <https://doi.org/10.12942/lrr-2008-5>.
- . 2011. "Loop Quantum Gravity: The First 25 Years." *Classical and Quantum Gravity* 28 (15): 153002. <https://doi.org/10.1088/0264-9381/28/15/153002>.

- Ruse, Michael. 2013. "Naturalism and the Scientific Method." In *The Oxford Handbook of Atheism*, edited by Stephen Bullivant and Michael Ruse, 383–397.
- Saatsi, Juha. 2017. "Explanation and Explanationism in Science and Metaphysics." In *Metaphysics and the Philosophy of Science*. New York: Oxford University Press.
<https://doi.org/10.1093/acprof:oso/9780199363209.003.0009>.
- Saunders, Simon. 2006. "Are Quantum Particles Objects?" *Analysis* 66 (289): 52–63.
- Schaffer, Jonathan. 2009. "On What Grounds What." In *Metametaphysics: New Essays on the Foundations of Ontology*, edited by David Chalmers, David Manley, and Ryan Wasserman, 347–83. Oxford: Oxford University Press.
- . 2010. "Monism: The Priority of the Whole." *The Philosophical Review* 119 (1): 31–76.
- . 2017. "Social Construction as Grounding; or: Fundamentality for Feminists, a Reply to Barnes and Mikkola." *Philosophical Studies* 174 (10): 2449–65. <https://doi.org/10.1007/s11098-016-0738-8>.
- Schlick, M. (1915) 1978. "The Philosophical Significance of the Principle of Relativity." In *Moritz Schlick Philosophical Papers: Volume 1: (1909–1922)*, edited by H.L. Mulder and B.F.B. van de Velde-Schlick, 153–89. Vienna Circle Collection. Dordrecht: D. Reidel Publishing Company.
- Schlosshauer, Maximilian. 2007. *Decoherence: And the Quantum-To-Classical Transition*. The Frontiers Collection. Springer.
- Sellars, Roy Wood. 1921. "THE REQUIREMENTS OF AN ADEQUATE NATURALISM." *The Monist* 31 (2): 249–70.
- . 1922. *Evolutionary Naturalism*. Chicago, London: Open Court Publ. Co.
- . 1927. "Why Naturalism and Not Materialism?" *The Philosophical Review* 36 (3): 216–25.
- . 1944a. "Is Naturalism Enough?" *The Journal of Philosophy* 41 (20): 533–44. <https://doi.org/10.2307/2020357>.
- . 1944b. "Does Naturalism Need Ontology?" *The Journal of Philosophy* 41 (25): 686–94. <https://doi.org/10.2307/2019823>.
- Shanahan, Timothy. 2003. "The Evolutionary Indeterminism Thesis." *BioScience* 53 (2): 163–69. [https://doi.org/10.1641/0006-3568\(2003\)053\[0163:TEIT\]2.0.CO;2](https://doi.org/10.1641/0006-3568(2003)053[0163:TEIT]2.0.CO;2).

Shtulman, A. 2017. *Scienceblind: Why Our Intuitive Theories About the World Are So Often Wrong*. Basic Books.

Shtulman, Andrew, and Kelsey Harrington. 2016. "Tensions Between Science and Intuition Across the Lifespan." *Topics in Cognitive Science* 8 (1): 118–37. <https://doi.org/10.1111/tops.12174>.

Sidelle, Alan. 2016. "Frameworks and Deflation in 'Empiricism, Semantics, and Ontology' and Recent Metametaphysics." In *Ontology after Carnap*. Oxford: Oxford University Press. <http://www.oxfordscholarship.com/view/10.1093/acprof:oso/9780199661985.001.0001/acprof-9780199661985-chapter-4>.

Sider, Theodore. 2011. *Writing the Book of the World*. Oxford: Oxford University Press.

———. 2017. "Substantivity in Feminist Metaphysics." *Philosophical Studies* 174 (10): 2467–78. <https://doi.org/10.1007/s11098-016-0739-7>.

Slurink, Pouwel. 1996. "Back to Roy Wood Sellars: Why His Evolutionary Naturalism Is Still Worthwhile." *Journal of the History of Philosophy* 34 (3): 425–49.

Soames, Scott. 2009. "Ontology, Analyticity, and Meaning: The Quine-Carnap Dispute." In *Metametaphysics: New Essays on the Foundations of Ontology*, edited by David Chalmers, David Manley, and Ryan Wasserman, 424–43. Oxford: Oxford University Press.

Soto, Cristian. 2015. "The Current State of the Metaphysics of Science Debate." *Philosophica* 90.

Stanford, P. Kyle. 2006. *Exceeding Our Grasp: Science, History, and the Problem of Unconceived Alternatives*. Online Access with Purchase: University Press Scholarship Online (Oxford Scholarship Online).: Philosophy Module. Oxford University Press.

Stenmark, Mikael. 2001. *Scientism: Science, Ethics and Religion*. Routledge.

Stewart-Williams, Steve. 2005. "Innate Ideas as a Naturalistic Source of Metaphysical Knowledge." *Biology and Philosophy* 20 (4): 791–814. <https://doi.org/10.1007/s10539-004-6835-7>.

Stoljar, Daniel. 2017. *Philosophical Progress: In Defence of a Reasonable Optimism*. Oxford: Oxford University Press.

Strawson, P. F. 1959. *Individuals: An Essay in Descriptive Metaphysics*. Routledge.

- Stroud, Barry. 1996. "The Charm of Naturalism." *Proceedings and Addresses of the American Philosophical Association* 70 (2): 43–55.
- Swanson, Noel. 2019. "How to Be a Relativistic Spacetime State Realist." *British Journal for the Philosophy of Science*, no. axy041. <https://doi.org/10.1093/bjps/axy041>.
- Tahko, Tuomas E. 2020. "A Priori or a Posteriori?" In *The Routledge Handbook of Metametaphysics*, edited by Ricki Bliss and J.T.M. Miller, 353–63. Routledge.
- Tallant, Jonathan. 2013. "Intuitions in Physics." *Synthese* 190 (15): 2959–80. <https://doi.org/10.1007/s11229-012-0113-z>.
- . 2015. "Metaphysics, Intuitions and Physics." *Ratio* 28 (3): 286–301. <https://doi.org/10.1111/rati.12074>.
- Teller, Paul. 1986. "Relational Holism and Quantum Mechanics." *The British Journal for the Philosophy of Science* 37 (1): 71–81.
- Thomasson, Amie L. 2014. "The Easy Approach to Ontology: A Defence." In *Philosophical Methodology: The Armchair or the Laboratory?*, edited by Matthew C. Haug, 107–25. Routledge.
- . 2015. *Ontology Made Easy*. New York: Oxford University Press.
- . 2017a. "Metaphysical Disputes and Metalinguistic Negotiation." *Analytic Philosophy* 58 (1): 1–28.
- . 2017b. "Metaphysics and Conceptual Negotiation." *Philosophical Issues* 27 (1): 364–82. <https://doi.org/10.1111/phis.12106>.
- Tuin, Iris van der. 2011. "'New Feminist Materialisms.'" *Women's Studies International Forum* 34 (4): 271–77. <https://doi.org/10.1016/j.wsif.2011.04.002>.
- Vaidman, Lev. 2014. "Quantum Theory and Determinism." *Quantum Studies: Mathematics and Foundations* 1 (1): 5–38. <https://doi.org/10.1007/s40509-014-0008-4>.
- Vartanian, Aram. 1953. *Diderot and Descartes*. Princeton: Princeton University Press.
- Vassallo, Antonio, and Michael Esfeld. 2014. "A Proposal for a Bohmian Ontology of Quantum Gravity." *Foundations of Physics* 44 (1): 1–18. <https://doi.org/10.1007/s10701-013-9745-1>.
- Vetlesen, Arne Johan. 2019. *Cosmologies of the Anthropocene*. London: Routledge. <https://doi.org/10.4324/9780429060564>.

Wang, Anzhong. 2017. "Hořava Gravity at a Lifshitz Point: A Progress Report." *International Journal of Modern Physics D* 26 (07): 1730014. <https://doi.org/10.1142/S0218271817300142>.

Weatherson, Brian. 2015. "Humean Supervenience." In *A Companion to David Lewis*, edited by Barry Loewer and Jonathan Schaffer, 99–115. John Wiley & Sons, Ltd. <https://doi.org/10.1002/9781118398593.ch8>.

Whitten, Barbara L. 1996. "What Physics Is Fundamental Physics? Feminist Implications of Physicists' Debate over the Superconducting Supercollider." *NWSA Journal* 8 (2): 1–16.

Willey, Angela. 2016. "A World of Materialisms: Postcolonial Feminist Science Studies and the New Natural." *Science, Technology, & Human Values* 41 (6): 991–1014. <https://doi.org/10.1177/0162243916658707>.

Wilson, Jessica. 2011. "Much Ado About 'Something.'" *Analysis* 71 (1): 172–88. <https://doi.org/10.1093/analys/anq087>.

Wilson, Jessica M. 2014. "Three Dogmas of Metaphysical Methodology." In *Philosophical Methodology: The Armchair or the Laboratory?*, edited by Matthew C. Haug, 145–65. Routledge.

Wolpert, Lewis. 1992. *The Unnatural Nature of Science: Why Science Does Not Make (Common) Sense*. London: Faber.

Woudenberg, René van, Rik Peels, and Jeroen de Ridder. 2018. "Introduction: Putting Scientism on the Philosophical Agenda." In *Scientism*. New York: Oxford University Press. <https://doi.org/10.1093/oso/9780190462758.003.0001>.

Wüthrich, Christian. 2017. "Raiders of the Lost Spacetime." In *Towards a Theory of Spacetime Theories*, edited by Dennis Lehmkuhl, Gregor Schiemann, and Erhard Scholz, 297–335. New York, NY: Springer New York.

———. 2019. "When the Actual World Is Not Even Possible." In *The Foundation of Reality: Fundamentality, Space, and Time*, edited by David Glick, George Darby, and Anna Marmodoro. Oxford: Oxford University Press.

Wylie, Alison. 2012. "Feminist Philosophy of Science: Standpoint Matters." *Proceedings and Addresses of the American Philosophical Association* 86 (2): 47–76.

Yablo, Stephen. 1998. "Does Ontology Rest on a Mistake?" *Aristotelian Society Supplementary Volume* 72 (1): 229–61.

———. 2009. “Must Existence-Questions Have Answers.” In *Metametaphysics: New Essays on the Foundations of Ontology*, edited by David Chalmers, David Manley, and Ryan Wasserman, 507–25. Oxford: Oxford University Press.

Zeh, H. D. 1970. “On the Interpretation of Measurement in Quantum Theory.” *Foundations of Physics* 1 (1): 69–76.

———. 1996. “Basic Concepts and Their Interpretation.” In *Decoherence and the Appearance of a Classical World in Quantum Theory*, edited by Erich Joos, H. D. Zeh, Claus Kiefer, Domenico Giulini, Joachim Kupsch, and Ion-Olimpiu Stamatescu, 7–40. Berlin, Heidelberg: Springer Berlin Heidelberg.

Zinkernagel, Henrik. 2016. “Niels Bohr on the Wave Function and the Classical/Quantum Divide.” *Studies in History and Philosophy of Science Part B: Studies in History and Philosophy of Modern Physics* 53: 9–19.

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