Realism Without Parochialism (1992)[*]

1. Introduction

I am a realist of a metaphysical stripe. I believe in an immense realm of "mathematical" and "modal" entities, entities that are neither part of, nor stand in any causal or external relation to, the actual, concrete world. For starters: I believe in mathematical objects and structures; in (concrete) possible worlds and individuals; in propositions, properties, and relations (both abundantly and sparsely conceived); and in sets (or classes) of whatever I believe in.[1] Call these sorts of entity, and the reality they comprise, *metaphysical*. In contrast, call the actual, concrete entities, and the reality they comprise, *physical*.[2] Physical and metaphysical reality together comprise all that there is. In this paper, it is not my aim to defend realism about any particular metaphysical sort of entity. Rather, I ask quite generally whether and how any brand of realism about metaphysical sorts of entity can be justified.[3]

Belief in metaphysical sorts of entity does not rest on acquaintance, or anything analogous to perception; by definition, we bear no causal relations to them. If we have beliefs about such entities at all, it is by way of description, through theories that postulate their existence. Thus, the question of belief in metaphysical sorts of entity may be shifted to the question of belief in

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[*] This paper is forthcoming in *Modal Matters: Essays in Metaphysics* (Oxford University Press). It was presented as a symposium paper at the Pacific APA meetings in March, 1992. Because it has been available on-line for many years, and cited in the literature, I have made only minor revisions, and added a postscript. Additions to the original paper are in square brackets.

[1] [See the introductory chapter of *Modal Matters* (Bricker forthcoming a) for an updated account of the entities I believe in; and see the postscript for relevant discussion. In particular, with respect to abundant properties and relations, and sets or classes, while I am committed to our discourse being true, the reduction of such discourse need not make them out to be entities in their own right.]

[2] [The distinction I make here between the "physical" and "metaphysical" realms is essentially the distinction between the "actual" and the "merely possible" that figures prominently in Bricker (2001, 2006). Neither terminology is ideal. Allowing unreduced mental entities and properties to be classified as "physical," if any there be, sounds odd. But allowing mathematical entities to be classified as "merely possible," as I do elsewhere in this volume, is also not in accord with usual ways of speaking.]

[3] I mean nothing fancy by 'realism': to be a realist about some sort of entity is just to believe that entities of that sort exist.

metaphysical theories. I believe in metaphysical sorts of entity because I believe theories postulating their existence to be true, to provide an accurate description of what there is.[4]

What criteria do I use in deciding which metaphysical theories to believe? Of course, if a theory is incoherent, it can be rejected out of hand. One way for a theory to be incoherent is for it to be logically inconsistent, but I suppose there are other ways.[5] Moreover, if a theory is unfaithful to the notions it aims to elucidate, be they notions of ordinary or of scientific thought, that too is a form of incoherence; it too can be rejected out of hand. Unfortunately, however, criteria of coherence appear to leave the choice of metaphysical theories vastly underdetermined. What to do? Enter here the broadly pragmatic criteria. According to conventional wisdom, we should believe theories that are, on balance, more fruitful, simple, elegant, unified, or economical than their rivals. We should believe pragmatically virtuous theories. It won't matter, for this paper, what a complete list of the pragmatic virtues would look like, or how the virtues are to be weighed one against another. The problem I want to discuss would remain even if only one pragmatic virtue played a role in deciding which metaphysical theories to believe.

The problem is this. It is one thing for a theory to be pragmatically virtuous, to meet certain of our needs and desires; it seems quite another thing for the theory to be true. On what grounds are the pragmatic virtues taken to be a mark of the true? It is easy to see why we would desire our theories to be pragmatically virtuous: the virtues make for theories that are useful, productive, easy to comprehend and apply. But why think that metaphysical reality conforms to *our* desire for simplicity, unity, and the other pragmatic virtues? Moreover, standards for simplicity, unity, and the like have been notoriously difficult to pin down objectively; it seems such standards may differ from culture to culture, era to era, galaxy to galaxy. Why think that metaphysical reality, even if simple and unified by some standards, conforms to *our* standards for simplicity and unity? Believing a metaphysical theory true because it is pragmatically virtuous leads to parochialism, and seems scarcely more justified then, say, believing Ptolemaic astronomy true because it conforms to our desire to be located at the center of the universe.

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[4] I use 'metaphysical theory' broadly to include any theory whose quantifiers are interpreted to range over metaphysical sorts of entity. [See the postscript for discussion.]

[5] [But see Bricker (forthcoming a) for my current, expansive notion of logical consistency applied to theories understood as collections of language-independent propositions. Thus understood, consistency and coherence will coincide. See also the postscript to this paper.]

Here I take my stand as a realist. I deny categorically that the pragmatic virtues of metaphysical theories are a mark of the true. Do I then abjure the use of pragmatic criteria in metaphysics? Not at all. The pragmatic virtues, I maintain, serve as criteria of acceptance, without serving as criteria of truth, or of reasonable belief. What I mean by 'acceptance' is this.[6] Suppose I want to write the book on metaphysics, to develop a grand unified theory of what there is. Of course, I want the book to be *true*. I also want the book to be *systematic* and *comprehensive*. It should include precise explications of all the fundamental concepts of our ordinary and scientific thought; it should be a complete articulation of our conceptual scheme. But I also want the book to be *succinct*. Metaphysics, after all, is a human endeavor. There is no expectation that all true metaphysical theories will earn a place therein. In particular, when different theories cover more or less the same ground, all but one may be omitted without sacrificing comprehensiveness. The metaphysical theories I accept are just those I would include in the book, in a grand unified theory of metaphysics.

I thus distinguish between acceptance and belief. I accept a metaphysical theory in part because I believe it true and in part because I would include it in the best comprehensive, succinct systematization of our fundamental ordinary and scientific beliefs. Pragmatic criteria of theory choice are relevant only to the goal of systematization, not to the goal of truth. I recognize no presumption that the more fruitful, simple, elegant, unified, or economical theory is more likely to be true; no presumption that reality is made in our image.

Call the view that I endorse *absolute realism*, or *absolutism*. It holds, first, that the notions of truth and reality are absolute: the metaphysical theories that are true for us are true for the Alpha Centaurians, true for all actual and possible thinkers. And it holds, second, that the notion of reasonable or rational belief is absolute: the epistemic principles that are correct for us, are correct for the Alpha Centaurians, correct for all actual and possible thinkers; and the correct application of these correct principles would lead all thinkers to belief in the same metaphysical theories (or to none at all).[7] Call any realist view that opposes either or both of these claims *parochial realism*, or *parochialism*.

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[6] My use of 'acceptance' needs to be distinguished from that of van Fraassen (1980). Unlike van Fraassen, I take acceptance to entail belief.

[7] Of course, I do not assume that all thinkers are capable of discovering the correct principles, or of correctly applying them, even if discovered.

One of the opponents I have in mind is David Lewis. Lewis squarely rests his defense of realism about possible worlds on pragmatic grounds. At the beginning of *On the Plurality of Worlds*, he writes: “Why believe in a plurality of worlds? —Because the hypothesis is serviceable, and that is a reason to think that it is true.” (Lewis 1986a: 3) According to Lewis—and I concur—possible worlds and individuals have proven enormously fruitful in diverse areas of philosophy. They provide “the wherewithal to reduce the diversity of notions we must accept as primitive, and thereby to improve the unity and economy of . . . total theory. . . .” (Lewis 1986a: 4). And, for Lewis, such theoretical benefits provide good (though not conclusive) reason for believing that possible worlds and individuals exist. Lewis has not, so far as I know, acknowledged that the use of pragmatic criteria leads to parochialism (in my sense); but I do not see how it could plausibly be denied.[8]

In this paper, I examine the prospects for absolute realism, for realism without parochialism. My aims are extremely modest. I do not expect to sway a content parochialist, much less an ardent renouncer of metaphysical sorts of entities. There is no thought of *proving* my basic conviction, that a parochial foundation for belief is no foundation at all. Nor will I attempt to provide an alternative foundation. My chief concern will be to show how absolutism can be reconciled with the free and inevitable use of pragmatic criteria of theory choice. In particular, I ask: what must one presuppose about metaphysical reality to ensure that the use of pragmatic criteria will not lead one to accept false theories. I argue that an absolutist must posit a vastly greater metaphysical reality then the parochialist ever would or could accept. Pragmatic criteria must be seen as selecting from, rather than determining, what is metaphysically real.[9] I conclude the paper by discussing briefly the views that I oppose.

The problem of pragmatic criteria in theory choice has been more often discussed in relation to scientific theories, than in relation to metaphysical theories.[10] I shall have little to say here about scientific realism. In my view, the cases are substantially different. The choice of

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[8] Other opponents—for example, Putnam and Quine—openly embrace parochialism. Quine (1992: 9) writes, for example: “The very notion of object, or of one and many, is indeed as parochially human as the parts of speech; to ask what reality is really like, however, apart from human categories, is self-stultifying. . . . Positivists were right in branding such metaphysics as meaningless.”

[9] [I first argued for this view in my doctoral dissertation, Bricker (1983, section 10).]

[10] See, for example, van Fraassen (1980: 87-96) and Boyd (1985).

scientific theories is based in large part on inductive and causal-explanatory criteria that play no role in the metaphysical case.[11] These criteria are not, in my view, essentially pragmatic; that is to say, although theories that satisfy these criteria tend to be pragmatically more virtuous than those that do not, the epistemic ground of these criteria is independent of their pragmatic consequences. Thus, pragmatic virtues are selected, not for their own sake, but because they ride piggyback on inductive and causal-explanatory virtues. Those pragmatic virtues that are systematically selected in this way may indeed be a mark of the true. But they are no more a ground of truth, I would argue, in science than in metaphysics.

2. Realism About Mathematical Theories

I reject the use of pragmatic criteria as grounds for truth or reasonable belief, not as grounds for acceptance. When the parochialist makes use of pragmatic criteria in a decision to accept some metaphysical theory, I want to be able to do so as well. The dispute between absolutism and parochialism, as I see it, need have little effect on metaphysical practice; it is a dispute over the best interpretation of that practice.[12]

Suppose, then, that a parochialist uses pragmatic criteria to choose one among a class of competing theories. An absolutist who wants to match that choice has two basic strategies at her disposal. She can find epistemically correct, non-parochial criteria that dictate the same choice, thus showing that the pragmatic virtues of the chosen theory ride piggyback on non-pragmatic virtues. Unfortunately, this strategy has limited use when dealing with metaphysical theories. Or, as a second strategy, the absolutist can argue that the theories in question should *all* be believed

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[11] We do say that metaphysical, as well as scientific, theories have “explanatory power.” In the case of metaphysical theories, I take it this is an amalgamation of pragmatic features involving fruitfulness, unification, and perhaps others. By causal-explanatory criteria, I have in mind principles that support inference to the existence of unobserved, and even unobservable, causes. [Those contemporary metaphysicians who accept a heavy-duty, non-pragmatic notion of metaphysical explanation, perhaps based on a metaphysical grounding relation analogous to causation, may have a way of rejecting parochialism without being plenitudinous realists. It will depend crucially on the epistemology that accompanies their metaphysics. I have in mind, especially, Fine (2001) and Schaffer (2009).]

[12] Reconciliation has its limits. The dispute over the interpretation of metaphysical theories, we shall see, carries with it a dispute over the extent of metaphysical reality; and that dispute is genuine, not verbal.

true—or, at least, believed true to the same high degree—in which case the pragmatic criteria serve only as grounds for acceptance, not as grounds for belief. That is the strategy I want to pursue in what follows. First, I will consider mathematical theories in some detail, where the strategy is familiar and more widely accepted; then I will briefly consider other metaphysical theories, and propose a parallel treatment.

There is no doubt that pragmatic criteria play a dominant role with respect to theory choice in mathematics. Theories that are fruitful and elegant earn a place within the body of mathematics; theories that are sterile or clumsy may earn a Ph.D., but are quickly forgotten. The use of pragmatic criteria in mathematics, however, is no threat to absolutism. The discarded theories, if consistent, are thought no less true for being sterile or clumsy. Pragmatic criteria determine which theories are worth pursuing and worth preserving for posterity, not which theories are true, or reasonably believed to be true.[13]

What if the choice is between logically incompatible theories, as frequently appears to be the case? The strategy has the onus of providing a plausible interpretation of the theories under which the *prima facie* incompatibility disappears. Otherwise, joint belief in all the theories would lead to belief in a logical contradiction. Consider the strategy's most famous application: the case of non-Euclidean geometry. On the face of it, Euclidean and the non-Euclidean geometries (say, of three dimensions) are logically incompatible theories: where Euclidean geometry asserts that through a point not on a line there is exactly one parallel to the given line, non-Euclidean geometries assert that there is no parallel, or more than one. If the geometrical terms, such as 'point', 'line', and 'intersect', have the same meanings throughout the different theories, then logic dictates that at most one of the theories be true. But modern mathematics treats all of these theories on a par: all are true, if any are. The solution, of course, assuming a realist interpretation, is to hold that some or all of the terms are equivocal between the different theories. Once the equivocation is set right, the theories are seen not to be logically incompatible, and there is no logical obstacle to believing all of them true.[14]

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[13] This is controversial with respect to set theory. Gödel (1947), for example, held that the pragmatic consequences of accepting, say, the continuum hypothesis, were relevant to its truth or falsity.

[14] I pursue only realist interpretations of theories in this paper. Another familiar reaction to non-Euclidean geometry, endorsed by formalists and logical empiricists, treats geometrical theories—

The equivocation will be differently diagnosed on different methods of interpreting geometrical theories. It will be worth our while to consider the interpretation of geometrical, and, more generally, mathematical theories in some detail as preparation for the discussion of other metaphysical theories. Let us say, as usual, that an interpretation of a theory consists of a domain of entities, and an extension over the domain (of appropriate type) for each primitive, non-logical term of the theory.[15] The simplest diagnosis of the equivocation would be this: the Euclidean theory and the non-Euclidean theories are each *fully interpreted* theories, that is, each has a unique "intended" interpretation; but the "intended" domains of the theories are mutually disjoint. Thus, the Euclidean theory makes assertions about Euclidean points and lines, the various non-Euclidean theories about various non-Euclidean points and lines, and no logical incompatibility can arise.

But just what is a Euclidean or non-Euclidean point or line? The theories themselves do not tell us; nor do the geometers who present the theories. The view that geometrical theories are fully interpreted, each with a unique intended interpretation, does not accord with modern mathematical practice. On the modern approach, a geometrical theory serves to characterize a geometrical structure (or, in more abstract branches of geometry, a class of geometrical structures), but without singling out a domain of entities instantiating that structure. There are many equally intended interpretations; the terms of the theory are thus *partially*, not fully, interpreted.[16] Which interpretations count as intended? The theory itself tells us something about the relations among points and lines; only interpretations that satisfy the theory count as intended. (An interpretation *satisfies* a theory iff all assertions of the theory are true in the interpretation, using the standard model-theoretic account of truth.) What about denumerable,

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if mathematical, rather than physical—as wholly uninterpreted, and thus as lacking in truth value or ontological commitment. See, for example, Hempel (1945).

[15] If our metalinguistic framework includes set theory, then domains and extensions of predicates can be identified with sets (or classes) in the usual way. But when the interpretation of set theory is itself at issue, talk of interpretations must be reconstrued within a framework admitting plural quantification and quantification over relations. (Relations need not be taken to be primitive if the framework includes mereology. See Lewis (1991), especially the appendix by Burgess, Hazen, and Lewis. [But note that I now prefer a different reduction of relations, and set theory generally; see Bricker forthcoming a: §2.])

[16] I do not mean to suggest that there is not some perfectly good sense of 'meaning' according to which the meanings of the geometrical terms are fully determined, say, by their theoretical or conceptual role. But on my usage, full meaning or interpretation requires determinate reference.

"Skolemized" interpretations that satisfy first-order formulations of the theory? Such interpretations are clearly unintended. I suppose that the geometrical theories are not formulated in a first-order way, so that the "Skolemized" interpretations do not satisfy the theories. That allows geometrical theories to be categorical, to determine their interpretation "up to isomorphism." Moreover, geometers sometimes—though not always—tell us more than the theory itself: points are simple and have no proper parts; lines are composite and have points as their simple parts; points are intrinsic duplicates of one another; and, perhaps, points and lines are "mathematical," not "physical," entities. I suppose that the intended interpretations satisfy these extra-theoretical constraints. But nothing we are told, explicitly or implicitly, fully interprets the terms of a geometrical theory.

Ordinary geometrical assertions about points and lines are now seen to be doubly equivocal. One equivocation is set right by relativizing to theory, for example, by replacing 'point' and 'line' by 'Euclidean point' and 'Euclidean line'. The other equivocation we let stand, but without thereby forfeiting talk of truth. A geometrical assertion about Euclidean points and lines, though equivocal, is true if true in all intended interpretations of Euclidean theory, and if there are some.[17] The Euclidean theory itself is then true just in case some intended interpretation exists. And, similarly, for the other geometrical theories. (Of course, for axiomatized theories, one can speak more simply of intended interpretations of the axioms.) Again, there is no logical obstacle to believing both Euclidean and non-Euclidean theories true. Geometers rarely explicitly affirm belief in the truth of their theories; but such belief, I take it, is presupposed by the acceptance of the theory into the body of mathematics.[18]

I have said that a theory is true if true in some intended interpretation. In other words, the theory is true if the theory and intentions, however formulated, together are true in some

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[17] Here I suppose it natural to adapt the method of supervaluations: an assertion is false if false in all intended interpretations, or if there are none; neither true nor false if true in some intended interpretations and false in others.

[18] One might prefer to view geometrical theories, not as partially interpreted, but as "Ramsified": what appear to be predicates are instead second-order variables bound to existential quantifiers prefixed to the theory as a whole (or, better, the conjunction of its axioms). Logically speaking, the differences are small: an equivocal predicate behaves logically just like a second-order variable (with appropriate range); and the presupposition of existence commits one to belief no less than its explicit assertion. But to the extent that the differences are genuine, they favor the partial interpretation view as being closer to actual practice. For a discussion of Ramsification as applied to set theory, see Lewis (1991: 45-54, 139-144).

interpretation; that is, if the theory and intentions together are *consistent*. Is consistency, then, the way to truth? No, even supposing there is no problem about formulating the intentions, consistency is no easier (or harder) to find than truth itself, for two well-known Gödelian reasons. First, given that mathematical theories are not first-order, there is no proof procedure in terms of which consistency can syntactically or formally be defined; consistency is thus itself a semantic notion, and cannot provide a non-semantic criterion of truth. Second, even if we were (mistakenly) to interpret theories as first-order, and define consistency as formal consistency, we would have no general method for establishing the consistency of a theory without simply assuming the consistency of some stronger theory.[19] Tying truth to consistency may serve to suggest the scope of truth; but it does nothing to provide a foundation.

I said there is no *logical* obstacle to believing all the geometrical theories true? What about *ontological* obstacles? Does believing all geometrical theories true step up demands on ontology? Not on the above characterization of intended interpretation. If each of the theories has some intended interpretation, then each has an intended interpretation over one and the same domain. That is because, on the usual model-theoretic account, nothing about the domain other than its size contributes to the satisfaction of the theory. And the extra-theoretical assertions, being the same for all of the theories, can all be satisfied by a single domain. Indeed, if we do not require that the domain consist of "mathematical" entities, then actual physical points (assuming there are continuum many), and fusions of physical points, will serve as an intended domain for both Euclidean and non-Euclidean theories. Of course, at most one such theory will have 'point' and 'line' interpreted, respectively, as the class of *physical* points and *physical* lines; but the other theories come out true under some non-physical interpretation. If, on the other hand, we require that the domain consist of "mathematical" entities, then a moderate belief in "pure" sets will meet the ontological demands of any ordinary geometry positing continuum many points; and to meet the demands of one is to meet the demands of all.[20]

As theories have thus far been construed, one can multiply belief without ontological cost because the intended interpretations are ontologically indiscriminate. That is a false victory for

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[19] We have no formal method, according to Gödel's second incompleteness theorem; and I know no reason to think there is some non-formal, accessible method.

[20] The extra-theoretical mereological demands may be satisfied too, if we accept the thesis, defended in Lewis (1991), that the parts of a (non-empty) set are its (non-empty) subsets. Points will then be singletons; lines will be unions (fusions), rather than sets, of points.

ontological parsimony. The present model-theoretic construal of truth for partially interpreted theories, though standard, does not seem to me plausible. Geometrical theories, I have said, posit a structure, and make assertions about whatever entities instantiate that structure. (I assume for simplicity we are considering only categorical geometrical theories.) Surely, whether or not some entities instantiate a posited structure is not solely a matter of their number; if it were, then geometrical theories would tell us *nothing* about which entities are points and lines. That is too much inscrutability. I think geometrical theories tell us that the points and lines, whatever they may be, instantiate the posited structure in virtue of their genuine, or *natural*, properties and relations. Call this genuine, or *natural*, instantiation: a domain of entities *naturally* instantiates the structure posited by a theory iff the theory comes out true under some *natural* interpretation over the domain, that is, some interpretation that assigns only natural properties and relations over the domain to the primitive, non-logical terms of the theory. I hold that, for any domain, irrespective of the nature of the entities, it makes sense to ask what natural properties and relations the entities stand in, and thus what structures the entities naturally instantiate. In general, only an infinitesimal minority of the classes of entities, and of the classes of *n*-tuples of entities, will be (or correspond to) natural properties and relations.[21] The distinction between natural and unnatural properties and relations is indispensable to the task of describing what there is, be it physical or metaphysical reality. It belongs to the universal framework of all theories, and as such is no less a part of logic than the existential quantifier or identity.[22]

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[21] On the need for a sparse conception of properties and relations that distinguishes between the natural and the unnatural, see Lewis (1986a: 59-69). Lewis's discussion focuses, however, on natural *physical* properties and relations. Some of what he says does not apply, I think, to natural *mathematical* properties and relations. In particular, I do not hold that all natural properties and relations are *qualitative*: mathematical entities and domains have no qualitative character; their nature is determined by structure alone. Lewis (1991: 51) suggests it would be "overbold" to think there are natural mathematical properties and relations other than, perhaps, a single primitive of set theory (for Lewis, the singleton relation). I am so emboldened. [Note that both 'natural' and 'qualitative' have narrow and wide construals. On the narrow construal, fundamental logical or purely structural (i.e. mathematical) properties and relations do not count as "natural" or "qualitative." Here, I am using 'qualitative' narrowly but 'natural' broadly. In Bricker (1996, 2001), my usage differs: I there take 'natural' more narrowly so that it excludes fundamental logical relations.]

[22] In a section of the *Aufbau*, Carnap (1928: section 154) endorses a structuralist interpretation of theories that quantifies over "natural relations," in effect endorsing what I call "natural instantiation." And he claims that the notion of a natural relation belongs to logic. (He calls natural relations "founded.") Thanks to David Lewis for this citation when he sent me comments

The truth of geometrical theories, then, requires natural instantiation. Natural instantiation should be compared with *model-theoretic* instantiation, according to which, for any two domains of the same size, either both or neither instantiate the structure posited by a theory, and with *elementary* instantiation, according to which, for any two infinite domains, of whatever size, either both or neither instantiate the structure posited by a theory. Equating truth of a geometrical theory with there being some model-theoretic instantiation of the posited structure seems to me hardly more plausible than equating truth with there being some elementary instantiation. Neither, I think, captures the intentions of geometers. Let us say, then, that an interpretation of a geometrical theory counts as intended only if its domain naturally instantiates (henceforth, just instantiates) the structure posited by the theory; that is, only if the interpretation both satisfies the theory and is natural.[23]

Is the strategy of believing all geometrical theories true now ontologically demanding? That depends. In the case where we drop the requirement that geometrical entities be "mathematical," we can no longer expect the points of physical space to provide an intended domain for more than one geometrical theory, since the physical points presumably do not instantiate more than one geometrical structure in virtue of their natural metric relations. A moderate belief in a plenitude of possible worlds, however, would provide all the theories with intended domains, assuming the structure of space is contingent. In the case where we keep the requirement that geometrical entities must be "mathematical," the mere existence of "pure" sets no longer suffices for truth. But the "pure" sets are rich in structure; they stand in myriad natural relations definable in terms of the membership relation. Familiar ways of interpreting Euclidean and non-Euclidean geometry within set theory—for example, by identifying points with tuples of real numbers, and real numbers with . . . —show how natural set-theoretical properties and

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on a draft of this paper. Lewis writes (letter of April 6, 1992): "[This little-known passage] is part of why I admire Carnap much more as a metaphysician than as an anti-metaphysician."

[23] It might appear that in more abstract areas of mathematics—abstract algebra and algebraic approaches to geometry—the model-theoretic approach to interpretation has taken over: the "points" of an abstract "space," it is explicitly asserted, may be any set, relations between "points" may be any set of ordered pairs of "points," and so on. I dispute this. The arbitrary, non-natural interpretations are themselves objects posited by the theory; they are not used to interpret the theory. The theories of abstract mathematics, nowadays, are couched entirely in set-theoretic terms, and the question how to interpret them is just the question how to interpret set theory. And for set theory, I suppose, only natural interpretations are intended.

relations may be assigned to primitive geometrical terms in such a way that the theory comes out true.[24] Thus "pure" sets, assuming *they* exist, provide intended domains for any ordinary geometry; and the strategy of multiplying belief need not yet result in multiplying entities if one already believes in sets.

Are all mathematical theories partially interpreted? The chief evidence for partial interpretation is this. Mathematicians are generally aware of the reducibility of mathematics to set theory, but they don't much care whether the basic entities of which they speak are taken *sui generis*, or are identified with pure sets. Either option is considered perfectly satisfactory.[25] When pressed about the existence of the entities, some turn formalist or structuralist; put them to one side.[26] Others maintain realism about the entities, and are aware that the two options are incompatible; but they nonetheless refrain from choosing between them. The choice is not considered to be a mathematical choice because it would make no difference to the truth of any

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[24] I cannot discuss here three important questions: (1) Which set-theoretical properties and relations are natural? First-order definability in terms of the membership relation (and identity) is both too broad and too narrow: too broad, because even single disjunctions of natural properties need not themselves be natural; too narrow, because, for example, the ancestral of a natural relation is itself natural. In any case, I suppose that the set-theoretical properties and relations that come into the standard reduction of mathematics to set theory are all natural. (Note that a definition can be arbitrary, in the sense that there are others that are just as adequate, without the defined property or relation being unnatural.) (2) Is naturalness all or nothing, or a matter of degree? If naturalness is a matter of degree, does instantiation of structures depend only on the *perfectly* natural properties and relations, or is it itself a matter of degree? If instantiation is a matter of degree, is the truth of partially interpreted theories a matter of degree as well? Probably all are a matter of degree; but I will continue to speak as if they are all or nothing. (3) Is the distinction between natural and unnatural relations compatible with the joint identification of relations with sets of ordered pairs, and of ordered pairs with sets, given that there are many natural ways of identifying ordered pairs with sets? If not, either relations or ordered pairs will have to be taken as primitive entities, *sui generis*. For discussion, see Sider (1996).

[25] For example—and examples could be multiplied—Enderton (1977: 66) begins the chapter on the natural numbers: "There are, in general, two ways of introducing new objects for mathematical study: the axiomatic approach and the constructive approach." Either approach, he says, may be used to introduce the natural numbers.

[26] We can bring them back as a last resort, but only if more straightforward interpretations of mathematical theories are known to fail. By "structuralism," I mean the view that mathematical theories are committed to the existence of structures only, not objects that instantiate the structures. See, for example, Resnik (1997). Another use of 'structuralism' is almost the opposite: one keeps the objects, but denies that they naturally instantiate structures, thus forcing a model-theoretic construal of theories. See Lewis (1991: 45-53).

mathematical theorem. Leaving the choice unmade is tantamount to leaving their theories partially interpreted.

This evidence obviously does not apply to set theory itself. But there are reasons for taking set theory—even second-order set theory—to be partially interpreted. For one thing, there seems to be no end to the discovery of undecidable "large cardinal axioms" that extend the height of the set-theoretic hierarchy; neither the axioms of Zermelo-Frankel set theory nor the iterative conception that underlies it determines the interpretation of the membership relation "up to isomorphism." Thus, many structures are compatible with both the theory and the iterative conception. If only one such structure were instantiated, I suppose we could single out the membership relation as the relation of this instantiated structure. But what reason could there be for thinking that just one such structure is instantiated? Perhaps pragmatic reasons of ontological parsimony would support unique instantiation; thus a parochialist need not deny that set theory is fully interpreted on account of the undecidable "axioms." But an absolutist cannot support full interpretation in this way. Second, even if somehow our conception of set did manage to single out a unique relation between entities and the sets formed from those entities, the universe of "pure" sets would not yet be determined. For that depends on singling out some entity to be the null set, and nothing set theorists say seems to come close to accomplishing that. Set theory tells us that the null set is the only set that has no members; and set theorists may add that it is a "mathematical" entity, not an ordinary individual. But since set theorists, as just noted, typically allow other "mathematical" entities that are memberless (but are members of sets), such as *sui generis* numbers or geometrical points, it follows that they do not intend to uniquely specify the domain of pure sets. I conclude, then, that mathematicians leave all their theories only partially interpreted.[27] The task of fully interpreting them, of fixing references for mathematical terms, if it can be done at all, is left to the philosophers.

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[27] Mathematicians do speak of *the* null set, *the* number three, *the* Euclidean plane. But this, of course, is compatible with partial interpretation; such talk requires unique reference within each intended domain, not across intended domains. Similarly, our use of 'the cloud' in ordinary English does not give evidence that we believe in a single object with an indeterminate border, a so-called "vague object."

3. THE PROBLEM OF UNIQUENESS

Can it be done at all? There are two problems that need to be separated: uniqueness and existence. Consider first uniqueness. Start with a categorical theory, such as (second-order) Peano arithmetic. If I am right that this theory is partially interpreted by number theorists, then, relative to a context in which number theory is being done, there is no fact as to whether natural numbers are *sui generis* entities, or are von Neumann "numbers," or Zermelo "numbers." One may stipulate, say, that 'natural number' means Zermelo "number"; that is, that 'zero' denotes the null set, that 'successor' denotes the singleton function, and that 'number' denotes the intersection of all classes containing the null set and closed under taking singletons. One thereby creates a context in which the ordinary meanings of the arithmetic terms have been changed by narrowing the range of "intended" interpretations. Relative to a context in which the stipulation is made, the following sentences are true: 'natural numbers are sets', 'two is the singleton of the singleton of the null set', and 'two is a member of three'. If instead one stipulates that 'natural number' means von Neumann "number," one creates a context in which the first and third sentences above are true, but the second sentence is false. The von Neumann stipulation has now become standard, and so stands as an established technical meaning for 'number' alongside its more ordinary meaning; thus today, in contexts where set theory is being done, the stipulation is presupposed unless explicitly denied. Still, relative to any ordinary context, the three sentences above are neither true nor false.[28] Does the von Neumann or Zermelo stipulation *fully* interpret the arithmetic terms? That depends, of course, on whether the set-theoretic terms are themselves fully interpreted.

One may also stipulate that natural numbers are *sui generis*. What does that mean? I take it that *sui generis* natural numbers—if any there be—have no superfluous structure among themselves, no structure that they are not required to have by the Peano axioms (or the extra-theoretical axioms, if any). I also suppose that the *sui generis* natural numbers stand in arithmetic relations only to one another. I will say that a domain of entities *matches* a structure iff (1) it instantiates that structure, and no more inclusive structure; and (2) the instantiating natural relations never hold between entities inside and outside the domain. We have, then, the

[28] Compare vague words of ordinary language (such as 'adult') which similarly may have one or more precise (or more precise) established meanings that are selected in certain contexts; and may for the nonce be given a precise (or more precise) meaning to serve some purpose at hand.

following: a domain of entities is *sui generis* relative to a mathematical theory iff the domain matches some structure posited by the theory.[29, 30]

For any mathematical theory, one may stipulate that the entities posited by the theory are *sui generis* (still waiving the problem of existence). Does the stipulation fully interpret the theory, and thus uniquely fix the reference of its terms? Not if the theory fails to be categorical; at best it would narrow the range of intended interpretations to one for each structure compatible with the theory. Thus, I doubt the stipulation that sets are *sui generis* uniquely fixes the reference of 'set'. What about categorical theories, such as Peano arithmetic? Does the stipulation that natural numbers are *sui generis* uniquely fix the reference of 'natural number'? That would require a non-trivial version of the identity of indiscernibles. Consider: Domains that match the same structure are identical. No; that is too strong. I am a realist about possible worlds, and I suppose that domains of worlds may match the same structure without the domains being identical; they may differ in their purely qualitative features.[31] That suggests we restrict our attention to "mathematical" domains. Intuitively, what characterizes a domain as "mathematical" is that its entities, as well as all fusions of its entities, lack any intrinsic qualitative character. (I say an entity lacks intrinsic qualitative character if its intrinsic nature is entirely determined by the number of its parts, and the *pattern* of instantiation of natural properties and relations among its parts.) Would the stipulation that the domain is both *sui generis* and mathematical fully interpret a mathematical theory? One still needs an indiscernibility principle: mathematical

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[29] The second condition on matching may not be part of the meaning of *'sui generis'*, as that phrase is commonly understood. Requiring *sui generis* domains to be thus isolated from one another does not allow, for example, the *sui generis* natural numbers to be included among the *sui generis* integers; or the *sui generis* points of two-dimensional Euclidean geometry to be included among the *sui generis* points of three-dimensional Euclidean geometry. If the second condition is left out, however, unique reference demonstrably fails. Infinitely many subdomains of Euclidean 3-space match the structure of the Euclidean plane.

[30] [When Michael Jubien commented on this paper at the APA meetings, he complained that no purely structural account of *sui generis* could capture what philosophers ordinarily mean by the notion. He claimed, for example, that *sui generis* numbers are entities that "in and of themselves are numbers." I find that confused. But if he is right that that is what philosophers ordinarily mean by *sui generis*, then I should be understood to be offering a useful replacement for that notion.]

[31] [I thus endorse *quidditism*. See Bricker (forthcoming a: §5.]

domains that match the same structure are identical. I know of no reason to disbelieve the principle; but no reason to believe it either.[32, 33]

4. The Problem of Existence

It may be, then, that uniqueness of reference is impossible to achieve when dealing with metaphysical sorts of entity. But uniqueness is a side issue. On the partial interpretation approach, uniqueness is not required for truth. Existence is another matter. *I hold that every coherent mathematical theory is true, with or without the stipulation that the posited entities are sui generis.*[34] That is ontologically quite demanding. It multiplies the number of basic kinds of entity well beyond what is needed for the truth of mathematics. It is time I said something to defend it. And what I say had better be compatible with absolutism: I do not want to replace a parochial desire for ontological uniformity with a no less parochial desire for ontological variety.

I ask first: why believe that every coherent mathematical theory is true? As noted above, a belief in pure sets would suffice, assuming the reducibility of mathematics to set theory; but my belief does not rest on a belief in sets. For one thing, there is nothing special about my belief in sets; the reasons I have for belief in sets apply, *mutatis mutandis*, to my belief, say, in natural numbers or in geometrical objects. For another thing, if I somehow discovered that set theory was incoherent and I had to retract my belief in sets, I would not also retract my belief in natural numbers or geometrical objects. My belief in sets, then, cannot be the sole support for those other beliefs.

How, then, do I support my belief in the truth of mathematical theories? Here is the barest sketch of an argument. I do not present it to convince: its premises are no less controversial then its conclusion. Consider the case of natural numbers. I understand Peano arithmetic. Moreover, I

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[32] It wouldn't help to *stipulate* that a domain is mathematical only if it satisfies the principle; that would merely shift the problem from uniqueness to existence.

[33] [I am now inclined to disbelieve it. The argument in Bricker (2001) against the identity of qualitatively indiscernible worlds can be applied to mathematical systems if one allows that it is contingent whether mathematical systems are actual.]

[34] [In saying that every coherent mathematical theory is true, I was implicitly understanding this as 'true of some domain, some portion of reality': the quantifiers of the theory are restricted to objects in the domain. This, of course, is the currently standard practice for interpreting mathematical theories. For the importance of this restriction, see the postscript.]

understand it as it is written, with existential quantifiers over entities called numbers, not in some devious way. (Partial interpretation, I insist, is not devious; if it were, then the standard understanding of vague language, and so of most of ordinary language, would be devious as well.) Understanding is a relation between a thinker and what is thought about, in this case, between me and domains that instantiate the Peano structure. If no such domains existed, I could not stand in this or any relation to them; relations hold only between what exists and what exists (in the broadest sense of 'exists'). Therefore, my understanding of Peano arithmetic entails the existence of domains that instantiate the Peano structure, that is, the truth of Peano arithmetic.

Of course, there are mathematical theories that I will never understand; and mathematical theories no human being will ever understand. But if the theory is capable of being understood by some actual or possible thinker, if it is in the broadest sense intelligible or coherent, then the above argument will apply. Or so says the absolutist: epistemic arguments must be the same for all actual and possible thinkers, and lead to belief in the same mathematical theories. I conclude that the coherence of a mathematical theory is sufficient grounds for its truth.

What about the added stipulation that the entities posited by the theory are *sui generis*? The same argument applies. The theory plus the stipulation, if coherent, is true. For example, I understand Peano arithmetic with the stipulation that the numbers are *sui generis*. Or at least I think I do. And if I do, then, by the above argument, *sui generis* numbers exist.

Of course, my claim to understand a theory is fallible, to varying degrees. For one thing, understanding requires logical consistency, and even the best of us can be wrong about that (as witness Frege and naïve set theory). Moreover, the framework I have used for interpreting theories may itself be incoherent, with its mathematical domains, and its natural mathematical properties and relations. In that case, the whole notion of *sui generis* mathematical entities may be incoherent as well. But the rejection of such entities on grounds of incoherence is compatible with the view that coherence suffices for truth and existence. And it is compatible with absolutism: such entities would not be rejected on grounds of ontological superfluity, or pragmatic undesirability.

But I do not believe my framework is incoherent. Thus, I believe in a vast universe of *sui generis* mathematical entities: for any structure, a mathematical domain that matches that structure. There are *sui generis* natural numbers, rational numbers, real numbers; *sui generis* Euclidean and non-Euclidean points and lines; and for each structure compatible with set theory, there are *sui generis* sets that instantiate the structure, as well as *sui generis* ordered pairs, sequences, ordinal and cardinal numbers. And on and on and on.[35]

Some would say my beliefs are extravagant. They would say: "since mathematics is reducible to set theory, all of these basic kinds but one are theoretically dispensable in science, mathematics, and (at least most of) philosophy; they are indefensible on pragmatic grounds." That moves me not. They may also say: "the vastness of your ontology flies in the face of common opinion." That would have some force if it were true: it would cause me to question my own beliefs. But I doubt that common opinion has much definite to say about the nature or extent of metaphysical reality. There is an offhand reluctance to admit the existence of any metaphysical sort of entity. When that is overcome, there remains a reluctance to identify kinds of entity that have been introduced into language or thought as distinct: the identification of, say, numbers with sets receives no support from the man on the street. As to the vastness of metaphysical reality: common opinion makes no distinction between orders of infinity; belief in the iterative hierarchy of sets has already left common opinion far behind.

My liberality does not extend to physical reality, to the actual, concrete world. With respect to an arbitrary physical theory positing some physical kind of entity, there is, if anything, a presumption against existence. To defeat that presumption, to justify belief in that physical kind, one needs evidence of causal interaction, direct or indirect, with entities of that kind. The more physical kinds one believes in, the more justification one needs. In general, with physical reality, believing in more is harder to justify than believing in less.[36]

Just the opposite is true, on my account, with respect to metaphysical reality. Our apparent understanding of a metaphysical theory carries with it a presumption in favor of existence. We need a reason to defeat that presumption, a reason for thinking our understanding is not genuine.

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[35] I do not say that distinct mathematical theories always have distinct *sui generis* domains. Distinct theories may posit the same structure, and thus be associated with one and the same basic kind. Identifications of this sort are discovered, not stipulated. But such identifications do little to limit the abundance of basic kinds. (A standard example: Boolean structures characterized in terms of the operations of "meet" and "join" are identical with corresponding Boolean structures characterized in terms of the "less than" relation.) [Note: what I here call simply "mathematical domains" I now call "mathematical systems"; see Bricker (forthcoming a: §§2 and 3.]

[36] [I would now restrict this claim to the entities that make up our physical universe. As to whether other possible worlds, isolated from our physical universe, are absolutely actual I am wholly agnostic.]

Believing in less than all we think we understand is what requires justification. In general, with metaphysical reality, believing in less is harder to justify than believing in more.

5. The Role of Pragmatic Criteria

Let us return, at long last, to the debate between absolutism and parochialism, and the absolutist strategy of reconciliation. Suppose the absolutist takes my broad-minded approach to metaphysical reality. Then she can freely make use of pragmatic criteria in deciding which theories to accept, even when ontological reduction is at issue. Suppose we are deciding whether to accept a metaphysical theory that identifies all mathematical entities with pure sets on grounds of ontological parsimony and theoretical unification. For the parochialist, this is a decision as to what to believe about the extent of metaphysical reality: to accept the theory is to decide that sets exist, and that mathematical entities other than sets do not. For the absolutist, this is a decision whether to narrow, by linguistic stipulation, the class of intended interpretations of mathematical theories to interpretations whose domains consist entirely of sets. It is a decision what to talk about. And the *sui generis* numbers, and other non-sets, are thought no less real for the decision not to talk about them. Now, there is no reason why an absolutist cannot allow the decision what to talk about to be based on its pragmatic consequences. All sides agree that doing mathematics entirely within set theory has pragmatic advantages: it unifies and simplifies the vast array of mathematical notions; it facilitates the cross-fertilization of mathematical theories; and so on. Thus, an absolutist, no less than a parochialist, can accept on pragmatic grounds the metaphysical theory that identifies all mathematical entities with pure sets. For the absolutist, however, the pragmatic criteria serve to select some portion of metaphysical reality to be the universe of discourse for our mathematical theories; they do not determine what is metaphysically real. Moreover, an absolutist, no less than a parochialist, can reject on pragmatic grounds any metaphysical theory that posits *sui generis* mathematical entities other than sets. For the absolutist, however, theories rejected on pragmatic grounds are not thereby false. They are merely useless because essentially redundant; we can say all that we care to say without referring to the reality of which they speak.

Conversely, an absolutist who does not take my broad-minded approach to metaphysical reality cannot freely make use of pragmatic criteria in deciding which metaphysical theories to accept. For suppose the absolutist is considering a class of competing metaphysical theories, all of which are thought coherent, and thought equally likely to be true. And suppose she narrow-mindedly takes the theories to be genuine alternatives: one of them at most is true. Finally, suppose she nonetheless accepts one of the theories on pragmatic grounds. Then she accepts a theory she does not believe to be true, since, as an absolutist, the pragmatic grounds do nothing to boost her degree of belief. Perhaps that is not so bad. Perhaps the goal of metaphysical theorizing, rightly understood, has only to do with systematization, and nothing to do with truth. Perhaps, the way to uphold an absolutist epistemology and a realist interpretation of metaphysical theories is to be wholly agnostic about the truth of metaphysical theories. But to embrace agnosticism is to abandon absolutism as herein characterized; it is to abandon absolute *realism*. Agnosticism is an alternative to realism, not a species thereof.

6. Realism About Metaphysical Theories

I turn now, all too briefly, to the consideration of non-mathematical metaphysical theories, such as theories of possible worlds, or propositions, or impure classes. You will not be surprised to find that I hold: *every coherent metaphysical theory is true*.[37] If that is to be at all plausible, coherence must go well beyond logical consistency, as ordinarily conceived. In particular, any theory that conflicts with principles of the framework by which I interpret and understand metaphysical theories will be rejected as incoherent. That will include numerous traditional theories of truth and existence, including parochialism itself.

If all coherent metaphysical theories are true, then much of what was said about the interpretation of mathematical theories will apply, *mutatis mutandis*, to other metaphysical theories; and again the absolutist can freely make use of pragmatic criteria in choosing among coherent theories. Consider, for example, theories of propositions. On their face, they are often

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[37] [Again, it is important to understand this as saying 'true *of some portion of reality'*. Moreover, I should have been more careful distinguishing two types of "metaphysical" theory. There are theories that are true of reality as a whole, such as theories of possible worlds or propositions; these theories may themselves deserve to be included among the principles of the framework. And there are "metaphysical" theories that are true only of some portion of reality, such as contingent theories describing the structure, or laws, or qualitative character of some possible worlds, or class of possible worlds. See the postscript.]

incompatible: some take propositions to be “structured,” some “unstructured”; some take propositions to be “intensional,” some “hyperintensional.” When properly interpreted, however, the incompatibilities disappear. Each theory serves to explicate a different conception of proposition; and the different conceptions are in peaceful coexistence. I do not say that every conception of propositions is coherent; some, for example, founder on the Liar paradox, and its kin. But if a conception of propositions is coherent, then the theory articulating that conception is true, and the entities posited by the theory exist. An absolutist who accepts only the most fruitful of coherent conceptions need have no fear of accepting false theories.

My approach to ontological reduction, too, is the same for metaphysical theories generally as for mathematical theories. For many philosophical purposes, the propositional theories are left partially interpreted; no attempt is made to provide each theory with a unique domain. For purposes of “ontology,” however, the theorist must decide whether the entities posited by a propositional theory are to be taken as basic, and if not, how they may be identified with the entities posited by some other theory. On my view, these “ontological” decisions are not, in general, matters for discovery;[38] they are matters for linguistic stipulation. Perhaps there are coherent metaphysical theories whose posited entities may not coherently be taken as basic; I address this question below. But when different “ontological” decisions are equally coherent, metaphysical reality accommodates them one and all; and again the absolutist can choose between them on pragmatic grounds.

Although I have used mathematical theories to motivate my approach to metaphysical theories in general, I do not claim that the case of mathematics is in all respects representative. There are ways that metaphysical theories may be incoherent that have little or no application in the mathematical case. For one thing, non-mathematical metaphysical theories typically serve to explicate notions of ordinary language and thought; if such a theory veers too far from ordinary usage, it is incoherent because analytically false. Mathematical theories, in contrast, have broken away from their ordinary origins, and cannot be charged with incoherence on these grounds. Mathematical “rings” cannot be faulted for not being round.

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[38] There are exceptions. As in the mathematical case, I allow for non-trivial discoveries that theories are analytically equivalent, and thus posit the same entities. For example, I suspect (with many others) that on some conceptions of properties, and some conceptions of classes, properties and classes coincide.

There is another, related way that mathematical theories may be protected from charges of incoherence. The mathematical entities of which they speak are isolated from the physical entities, not just causally, but with respect to all natural relations; and the mathematical and physical entities have nothing but purely structural natural properties in common. Being thus isolated and dissimilar from the physical realm, the mathematical realm runs little risk of conflicting with fundamental principles of ordinary thought; for ordinary thought is directed first and foremost towards the physical. Non-mathematical metaphysical theories posit entities more closely tied to the physical realm; that makes judgments as to their coherence inevitably less secure.

Let me illustrate. Begin with the mathematical theory of Newtonian spacetime. Add that the spacetime points match the Newtonian structure. Now consider two purely qualitative natural properties that hold of point-sized objects (assuming there are such); call them 'red' and 'blue'. Add to the theory that everything is "blue" up to and including some time, and then "red" thereafter. Add that nothing has any other qualitative property. I think I understand the resulting theory, *modulo* an understanding of 'red' and 'blue'. I therefore think the theory is coherent (if qualitative natural properties of point-sized objects are), and that there exists a domain of entities of which the theory is true. I call (the fusion of) any such domain, naturally enough, a possible world.

(Of course, the example generalizes. Start with any spatiotemporal structure, with any class of purely qualitative natural properties and relations, and with any distribution of just those properties and relations over the domain of the structure; one thereby describes a possible world.[39] The details needn't concern us here. What I have to say about coherence applies whether one posits one world or many.)

Are the worlds that I believe in the worlds of David Lewis? No, it is a principle of my framework that the distinction between physical and metaphysical reality—between the actual, concrete world and everything else—is a fundamental ontological distinction; whatever is of the same ontological kind as a part of physical reality is itself a part of physical reality. Since

[39] What if one starts with an arbitrary mathematical structure, say, a four-element group? The resulting theory is no less coherent, and the domains that satisfy the theory are no less real; but they would not, in general, properly be called "possible worlds."

Lewis's worlds are of a kind with physical reality without themselves being physical, I judge them incoherent relative to my framework.

And Lewis, I suspect, would return the favor. What I call worlds Lewis might call "pictorial ersatz worlds."[40] On my account, parts of possible worlds and parts of physical reality can share qualitative character—indeed, can be qualitative duplicates—even though they are of fundamentally different ontological kinds. Is that coherent? I think it is, but I won't try to defend that here. My point has been made. Metaphysical theories positing entities that share qualitative character with physical entities face challenges to their coherence that do not arise in the mathematical case.

Mathematical domains and unactualized possible worlds have this in common: they are all isolated from the physical realm. Other metaphysical sorts of entity are less aloof. Consider again some theory of propositions. Of the propositions that purport to describe physical reality, some succeed and some do not; the successful ones we call true. Any adequate theory of propositions, I suppose, will be in part a theory of this relation between the true propositions and the physical reality they purport to describe. The theory thus posits a structure with a "mixed" domain: part physical, part metaphysical. And the two parts are interrelated, I suppose, by some natural external relation.

Now, within the physical realm, an object's intrinsic qualitative character does not determine the natural physical relations that it bears to other objects: this pen is touching a piece of paper, but nothing about the pen's intrinsic qualitative character necessitates that that be so. Within the mathematical realm, the same principle vacuously applies: since a mathematical entity has no intrinsic qualitative character, nothing is necessitated by its intrinsic qualitative character. What about a mixed realm, containing physical and metaphysical entities standing in natural external relations to one another? The principle is violated. Somehow, the intrinsic qualitative character of this pen makes it absolutely necessary that the pen stand in the truth-making relation to some propositions, but not others (and, for good measure, in the instantiation relation to some properties, but not others, and in the membership relation to some classes, but

[40] Except that I include the actual, concrete world among the possible worlds, and deny that there must be some "ersatz" world that represents the actual, concrete world. See Lewis (1986a: 165-174), for Lewis's discussion and dismissal of pictorial ersatzism. [I now think the view I espouse is better classified, not as pictorial ersatzism, but as realism with absolute actuality; see Bricker (2001, 2006).]

not others). A fundamental modal principle that holds for all natural physical relations fails to hold for all natural relations. Is that coherent?[41]

I think it is.[42] I do not see why the modal principle in question must apply generally to all of reality. One must beware of false projection. But I won't try here to defend theories of propositions (or properties, or impure classes). My point is this: theories positing metaphysical entities that stand in external relations to the physical realm face serious challenges that do not arise in the mathematical case.

The working mathematician's attitude towards the objects of which she speaks, as summarized by David Lewis, is this: "No worries, it's all abstract!" I have more or less supported that attitude towards mathematical entities, naïve though it be. Worry seems out of place in mathematics, formalists and intuitionists aside. Lewis considers metaphysicians who defend controversial ontology by mimicking the mathematician's response: "No worries, it's all abstract!" And when asked what that means, they say: "You know, abstract the way mathematical entities are abstract."[43] I have tried to distance myself a little ways from that response.

First, I have refrained from calling all the parts of metaphysical reality "abstract." What makes the mathematical entities abstract (in one sense of 'abstract') is their purely structural character. "Modal" entities, such as possible worlds, are not abstract in that way, because they have qualitative character. "Intensional" entities, such as propositions, are not abstract in that way, because their character depends in part on relations to the physical. Labeling all these kinds of entity 'abstract' would serve only to cover up their fundamentally different natures.

Second, worry does not seem out of place when considering "modal" or "intensional" entities. The carefree existence of mathematical entities need not transfer to other metaphysical kinds. I worry that my belief in, say, possible worlds or propositions, may be wrong. But worry

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[41] The above is adapted from Lewis's (1986a: 176-91) argument against magical ersatz worlds. Lewis would not quite say that the (unreduced) propositions, or properties, or classes, are incoherent; only that if we do somehow understand them, we know not how we do it.
[42] [I am less sanguine today about the coherence of positing an irreducible realm of propositions, or other "intensional entities." Any restriction of Humean principles to some parts of reality will be hard for the Humean to justify. See Bricker (forthcoming a: §2) for some discussion of whether the "realm of representation" reduces to the "reality of things."]
[43] Lewis (1986a: 137). Lewis is addressing the various ersatz modal realists.

alone cannot defeat the presumption of existence. Until an argument convinces me that I could not understand what I think I understand, I will continue to believe.

7. Frege vs. Hilbert on Truth and Existence

The approach that I take to truth and existence is often associated with David Hilbert and the formalist philosophy of mathematics.[44] Hilbert wrote, in a well-known letter to Gottlob Frege: "If the arbitrarily posited axioms together with all their consequences do not contradict one another, then they are true and the things defined by the axioms exist. For me, this is the criterion of truth and existence."[45] Frege responded with two objections. The first was epistemological. Since one can only know that a theory is consistent if one knows that there exist objects of which the theory is true, consistency cannot provide a foundation for truth and existence. Frege's objection pushed Hilbert down the path of formalism. I do not follow Hilbert down that path. For one thing, it leads to Gödel's cul-de-sac: not even formal consistency is epistemologically secure. But more important, to even begin down that path is to forfeit any claim to be giving a criterion for truth and existence. On a formalist interpretation, mathematical theories are not true, and have no existential import. Formalism does not provide an account of truth and existence in mathematics, but a discounting of these notions altogether. How, then, can a realist respond to Frege's objection? Concede the point: the criterion does not provide a foundation.

Frege's second objection to Hilbert's criterion was posed as a question:

> Let us suppose that we know that the propositions:
>
> 1. A is an intelligent being.
>
> 2. A is omnipresent.
>
> 3. A is omnipotent.

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44 [More recently, it has been discussed by Balaguer (2001) under the name "full-blooded platonism" and Eklund (2006) under the name "maximalism." It also has affinities with Thomasson's (2014) "easy ontology" and Hale and Wright's (2001) "neo-Fregeanism."]

45 Reprinted in Frege (1980: 39-40).

> together with all their consequences did not contradict one another. Could we infer from this that there exists an omnipotent, omnipresent, intelligent being? (Frege 1980: 47)

It appears that Hilbert's criterion applies, and that the answer to Frege's question is "yes." But that, I take it Frege would say, is objectionable. It shouldn't be that easy to prove the existence of a deity.

Hilbert promised Frege a letter in response; to Frege's chagrin, it never came. But I don't much care what Hilbert's formalist response might have been. I offer a realist response in its place. First, Frege's question needs disambiguating. There are two distinct realms of existence: the physical and the metaphysical. Typically, when we use 'exist' and its cognates, we speak only of some or all of physical reality. Is Frege asking whether the criterion leads to the existence of a being that is, among other things, physically located and physically active? If that is his question, then the answer is "no"—at least as I construe the criterion. The criterion has no implications for the existence of physical beings. The criterion leads only to *a priori* knowledge. All knowledge of physical reality is *a posteriori*.

On the other hand, Frege may be asking whether the criterion leads to the existence of an intelligent, omnipresent, omnipotent being in the widest sense of 'exist', as a part of either physical or metaphysical reality. Indeed, I think it does, assuming Frege's mini-theory is coherent. But the existence of such a being as a part of metaphysical reality, presumably off in some possible world, does not seem to me objectionable. Such a being is causally isolated from the physical realm. An easy proof of its existence provides small comfort for the deist.

8. Conclusion

I conclude the paper by discussing briefly the views that I oppose: first the parochialist, then the skeptic. Suppose we have before us a metaphysical theory that is universally agreed to be fruitful and elegant. I ask: why is fruitfulness or elegance a reason to believe the theory true? I hold that fruitfulness and elegance are good reasons to develop and use a theory believed true on other grounds; the parochialist holds that fruitfulness and elegance are good reasons (though, I suppose, not sufficient reasons) to believe the theory true.

I distinguish two such parochialists, depending on whether they deny the absoluteness of truth, or of epistemic rationality. The first parochialist is a traditional pragmatist, and endorses a pragmatic theory of truth: having appropriate pragmatic features is part of what constitutes a theory's being true, part of the meaning of the word 'true'. This seems both wrong and unhelpful: wrong as a claim about ordinary language; unhelpful, because it evades rather than answers the question I intended to ask. Suppose I give the pragmatist the word 'true'. I can rephrase my question thus: why believe that the theory in question agrees with reality, or describes what there is? Well, you know how the dialectic goes. The pragmatist won't be content with the word 'true'; he'll claim that pragmatic criteria in part determine the meaning of 'reality', 'existence', our whole vocabulary for talking about what there is (including 'is'). But this is still unhelpful. Suppose I give the pragmatist this whole vocabulary. The question I intended to ask still remains, inexpressible though it be in the appropriated language. Pragmatic reinterpretation does not make it go away.

The other parochialist holds to a realist conception of truth, and a realist interpretation of theories. She holds that the pragmatic criteria of theory choice are constitutive, not of truth, but of reasonable belief. Perhaps she argues thus. The standards by which our community in fact designates beliefs as reasonable, she claims, determine the very meaning of 'reasonable', and these standards are pragmatic through and through. I deny both conjuncts. Moreover, even if I granted that pragmatic criteria were part of what we mean by 'reasonable belief', it would do nothing towards answering the question I intended to ask.

First off, I doubt that the standards by which we in fact adjudge beliefs reasonable are pragmatic through and through. Often, we deem it reasonable to believe the simpler or more fruitful hypothesis, not on pragmatic grounds, but because of the nature of the subject matter; for example, reasonable hypotheses about human behavior tend to be simple and fruitful because human beings are simple creatures, who typically do things for a reason. The subject matter of all of physical science cannot be supposed simple in this way; but here, I think, the use of pragmatic criteria has been much overestimated. Scientist's affirmations of belief are normally comparative judgments among alternative theories; and scientists rarely, if ever, consider alternatives differing only on pragmatic features. Thus, the case for pragmatic criteria as grounds for belief in science is virtually impossible to make.[46] In any case, our concern here is with metaphysical, not scientific, theories; and our standards of reasonableness in the two cases need not coincide. In mathematics, I have said, theories that are unfruitful or inelegant are not thereby deemed false. In philosophy, the use of pragmatic criteria as grounds for belief has waxed and waned over the years. I doubt that philosophical practice, historically viewed, manifests any consensus on standards of reasonable belief in metaphysics.

Even supposing that our standards of reasonable belief are pragmatic, I deny that such standards constitute the meaning of ‘reasonable belief’, any more than, say, our standards for measuring distance constitute the meaning of ‘distance’; neither term is “operationally” defined. Our standards for measuring distance may be wrong, whether or not we could ever discover that they were wrong; and similarly for our standards of reasonable belief. What is constitutive of reasonable belief is that it be formed according to standards that are reliable, though perhaps fallible, guides to the truth. If I somehow discovered that one of the standards we use was not reliable in this way, I would retract the designation ‘reasonable’ from beliefs formed in accordance with that standard without the meaning of ‘reasonable’ having thereby changed.

Finally, even were I to grant that pragmatic criteria are constitutive of reasonable belief, that would not help answer the question I intended to ask. I could rephrase it thus: Why have reasonable beliefs? Why think this will further our pursuit of the truth? For the realist, at least, our practice of forming beliefs has a goal external to itself—the goal of truth—and so the question inevitably arises, whether the practice is justified in the sense of being suited to attain that goal. It is no justification to simply point out that it is our practice, or that, on reflection, we are satisfied with it, or that we know of no better. Nor, for that matter, is it justification to point out (wrongly, I think) that, perhaps for evolutionary reasons, we are (biologically) incapable of conforming to any other.[47] At most, that would justify—that is, make blameless—our *use* of the practice; it would not justify the practice in the relevant sense of showing that it leads reliably to the truth.

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[46] Recall what was said above: inductive and causal-explanatory criteria of theory choice are not, on my view, pragmatic.

[47] Lycan (1988), for example, pursues an evolutionary response. I am the “snooty epistemologist” of his scenario.

Please don't misunderstand. I am not demanding that the parochialist justify her use of pragmatic criteria; I point out that she has not done so only in order to make room for my own view. The demand for a justification of all epistemic principles is surely illegitimate. Indeed, I myself have no intention of foregoing the use of inductive criteria pending a solution to the problem of induction. Nonetheless, the cases of inductive and pragmatic criteria are not, for me, alike. The very conceivability of justification for pragmatic criteria is ruled out by their parochial nature; no criteria directly tied to specifically human needs, interests, or desires could conceivably be linked to truth and reality, absolutely understood. Although it has been argued that inductive criteria, too, are parochial, it can plausibly be denied; and I deny it.

I turn now briefly to my opponent on the other side: the skeptic about metaphysical sorts of entity. The skeptic and I agree in rejecting pragmatic criteria as grounds for belief. But the skeptic is not much impressed by my argument that coherence suffices for truth. The skeptic allows that one may reasonably choose to contemplate a metaphysical theory, or to develop it, or to examine its consequences; but one may not reasonably believe the theory true. The only reasonable position, says the skeptic, is to withhold belief in metaphysical sorts of entity.

Here the realist may protest: metaphysical theories have their "data," no less than scientific theories; there are fundamental mathematical and modal intuitions that any account of reasonable belief must respect. The skeptic has a familiar argument in response. Metaphysical sorts of entity, by their nature, do not causally affect us in any way. Thus, all of our intuitions, our beliefs, indeed, all of our psychological states would be the same whether such entities existed or not.[48] It follows that our intuitions, beliefs, and states cannot provide evidence that these entities exist. So argues the skeptic.

But the argument has no force against the realist. How are we to understand this subjunctive conditional: if metaphysical sorts of entity did not exist, our psychological states would be just as they are? As such conditionals are standardly understood, it is the barest triviality.[49] If the antecedent is true, the conditional is true merely in virtue of the truth of its

[48] This assumes a "narrow" individuation of psychological states; but I have no problem granting that assumption.

[49] [Since this was written, there have been various proposals for using impossible worlds to provide a non-trivial semantics for counterpossibles; see especially Nolan (1997). But the distinctions of content that these proposals aim to capture are elusive, and, in any case, won't do much to bolster this argument. See Bricker (forthcoming a: §4) for my take on the content of

consequent. If the antecedent is false, it is impossible, and anything follows from an impossible supposition: our psychological states would be just as they are, they would be different, they would be whatever you please. To the extent that the conditional seems non-trivial, it only reiterates the assumption that the metaphysical entities are causally independent of our states; and to suppose causal dependence is a prerequisite of knowledge, or reasonable belief, is to suppose just what the realist is at pains to deny.

The skeptic's argument cannot compel the realist. Nor, I think, can the realist's appeal to fundamental intuitions as incontrovertible "data" compel the skeptic. For what are fundamental intuitions if not fundamental beliefs, and such beliefs cannot serve as grounds for themselves. Nor will the skeptic be moved by Cartesian appeals to the clarity and distinctness of our fundamental intuitions or beliefs: illusions need not lack for clarity and distinctness. No, the realist should not expect to counter the skeptical challenge by argument; the only counter to a coherent skepticism is belief itself.

Thus, I reject the skeptic's demand that I give good reasons for my belief in metaphysical sorts of entity. I have my reasons, to be sure, but they are not reasons the skeptic will accept; and if asked to give reasons for these reasons, my reason giving soon comes to an end. I am not against believing without good reasons; for that is just to allow that some beliefs are basic, and cannot be supported by reasons at all. What I am against is believing for bad reasons. Better, I say, to reject the skeptic's demand for reasons altogether, then to put forth parochial reasons as grounds for belief.

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impossible propositions. Note, however, that because I take mathematic theories to be contingent—true at some mathematical systems, false at others—I allow that some counter-mathematicals are determinately false on the orthodox semantics. For example: "If the real number –1 had had a square route, it would have had only one square root" is determinately false: in the closest mathematical systems in which it has a square root, it has two.]

Postscript to “Realism Without Parochialism” (2018)

The linchpin of my project to renounce pragmatic criteria of truth without sacrificing realism is my acceptance of the principle: *every coherent metaphysical theory is true*. By “metaphysical theory” I meant, not “theory promulgated by metaphysicians,” but “theory interpreted to be about (what I call) metaphysical sorts of entity,” such as mathematical or modal entities, entities that are not part of the concrete, physical realm. In this postscript, I consider two familiar objections to this principle that I think are easily disarmed. I then consider what I take to be the largest challenge: determining the proper scope of the principle. But first, I want to say three things by way of clarifying the principle itself.

I apply the principle first, in Section 4, to mathematical theories. This application has a historical pedigree, as I note, going back at least to Hilbert.[50] But it has also been endorsed by many contemporary philosophers who accept versions of mathematical structuralism. If one takes mathematical theories to be true, not of mathematical *structures*, but of mathematical *systems* (as I do in Bricker forthcoming a), the resulting view may be called “plenitudinous platonism.”[51] In Section 6, I apply the principle also to physical (and other scientific) theories, theories that describe alternative ways that concrete, physical reality might be. In this case, the principle leads to the positing of concrete possible worlds and *possibilia*: false physical theories, if coherent, are true in non-actual possible worlds. This application of the principle is well known but less well accepted by philosophers when the posited worlds are concrete, and goes by the name “modal realism.” Somewhat surprisingly, philosophers who accept plenitudinous platonism rarely accept modal realism, and the philosopher most known for modal realism—namely, David Lewis—was not a plenitudinous platonist. I find this surprising because what I take to be the chief motivation for either of these views is that coherent theories need *content*—entities that the theories are *about*—and this motivation applies with equal justice and in similar ways to mathematical and physical theories. Indeed, by applying the principle to *all* coherent theories, I endorse a unified conception of the mathematical and modal realms. (Again, see

[50] It has also been attributed to Poincaré. He wrote, for example: “a mathematical entity exists provided there is no contradiction in its definition.” (1905: 44). But Poincaré was no platonist; he had a deflationary notion of mathematical existence.

[51] See especially the “full-blooded Platonism” of Balaguer (2001). Structuralist accounts of mathematics are developed in Shapiro (1997) and Resnik (1997).

Bricker forthcoming a.) But wait: didn't I restrict the principle to coherent *metaphysical* theories? As noted above, that is not a restriction on theories but on how the theories are to be interpreted. For any theory, one can ask whether it is made true by the physical realm or whether it is made true by the metaphysical realm. The principle I endorse applies to *all* coherent theories *when interpreted metaphysically*. I call this view "plenitudinous realism."

A second clarification is this. The notion of truth involved in the principle, as I hope the examples in the paper made clear, is not truth *simpliciter*, but relative truth: every coherent theory is true *of some portion of reality*. Coherent mathematical theories are true *of mathematical domains*; coherent physical theories are true *in possible worlds*. In determining whether a theory is true of some portion of reality, one must restrict all the quantifiers of the theory so that they range only over the entities that make up that portion. And if the theory refers to an individual entity (or natural kind) by name, one must consider *counterparts* of that entity (or kind) within the relevant portion of reality. I do not reject truth *simpliciter*, truth about reality as a whole. Indeed, if the restriction to the quantifiers and reference to counterparts is made explicit, the resulting theory is true *simpliciter*. But the principle has us get at what is true *simpliciter* in a piecemeal way, by determining first what is true in this portion of reality or that.

The third point of clarification answers this question: why 'coherent' instead of 'logically consistent'? In what ways could a consistent theory fail to be coherent, and so fail to be true of some portion of reality? When I wrote this paper, I had two main reasons for formulating the principle using 'coherent'. First, I was taking theories to consist of sentences, not propositions. A sentence may be logically consistent in virtue of its form but analytically or conceptually impossible and so not coherent, at least as these terms are ordinary applied to sentences. For example, 'some bachelor is married' is logically consistent, but not coherent. But if instead we take theories to consist of propositions—as I now prefer—whether structured or unstructured—and we take the consistency of propositions to depend only on content, not on form, then logical consistency and conceptual possibility coincide. This first reason for using 'coherence' no longer applies. Second, I was understanding 'coherent' to mean: *consistent with the principles of the framework*. Thus, unless all principles of the framework are logically necessary, consistency and coherence will not coincide. For example, I take the mereological thesis of unrestricted composition to be a principle of the framework. On the usual understanding of logical notions, this thesis is not logically necessary, and so the denial of the thesis is consistent; but if unrestricted composition is a principle of the framework, its denial is not coherent. But I now prefer to understand logic in a much broader way, indeed, in a way that makes all the principles of the framework, even the principle of plenitude now under discussion, logically necessary; see Bricker (forthcoming a). And on that broad conception of logic, consistency and coherence coincide. To some extent, this is just a terminological decision; and it is not a decision most philosophers make. But, in any case, it means that my second reason for using 'coherent' instead of 'consistent' also no longer applies on my current understanding of these terms. I thus use 'coherent' and 'consistent' interchangeably in what follows.

With these three clarifications in place, I can state the principle more simply. Rather than speaking of theories, I will speak of the single proposition that is the conjunction of all the members of the theory. (There is no problem here taking infinitary conjunctions if need be, since the Boolean algebra of propositions is complete; see Bricker 1983: 33-8). Then the principle I endorse is equivalent to what I call in Bricker (forthcoming a) the "law of plenitude": *every consistent proposition is true of some portion of reality*. The notion of consistency, and so this law, applies in the first instance to *unstructured* propositions. But since every structured proposition corresponds to at most one unstructured proposition, consistency, and this law, apply derivatively to *structured* propositions as well, however we choose to delineate structure.

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I am now in a position to make short shrift of the two objections to plenitudinous realism I most commonly hear. These objections may apply to close cousins of my view, but they do not apply to the view as I understand it. One of these close cousins is the view that Eklund (2006: 102) calls "maximalism," which he introduces as follows: "For a given sortal F, Fs exist just in case (a) the hypothesis that Fs exist is consistent, and (b) Fs do not fail to exist, simply as a matter of contingent empirical fact."[52] Without clause (b), he claims, the maximalist would be committed to the existence of entities—such as yetis—that "we have empirical reasons not to believe in." He concedes that there are "significant problems" concerning the formulation of (b), but sets those problems aside and relies on "an informal understanding." Indeed, clause (b) is problematic. If "matters of contingent fact" include some or all facts of existence, it is hard to see

[52] I do not know how broadly Eklund understands 'sortal', or even whether he takes sortals to be linguistic expressions or non-linguistic concepts or properties. It won't matter for what I say. And I will follow Eklund in being loose with use and mention.

how the maximalist criterion of existence avoids circularity; it needs a characterization of "what exists as a matter of contingent fact" that is independent of "what exists *simpliciter*."

Call this first problem for maximalism the *problem of empirical conflict*.[53] Fortunately, it is not a problem for the plenitudinous realist's criterion of existence, the law of plenitude, because as propositions are being interpreted there is no need for a clause (b): the extent of the physical realm—what I elsewhere call the realm of absolute actuality—is irrelevant to what the law claims. To see this, consider the following familiar hypothesis, once believed by the scientific community: the laws of physics are Newtonian, and there is a planet, Vulcan, located between Mercury and the sun that is responsible for the anomalous precession of Mercury's perihelion. This hypothesis, of course, is now known to be false—false, that is, of the physical universe that we inhabit. But the hypothesis is consistent, and so by the law of plenitude, there is a portion or reality of which is it true. But wouldn't that portion of reality have to contain Mercury and the sun, and thus require that Vulcan exist in the physical universe after all, contradicting well-established empirical fact? Of course not. According to plenitudinous realism, because the hypothesis is empirically false, the portion of reality of which the proposition is true is isolated from the portion of reality we inhabit. It contains *counterparts* of Mercury and the sun, not Mercury and the sun themselves. Because the hypothesis is interpreted "metaphysically," so as to allow its quantifiers to range over the metaphysical, or non-actual, realm, the facts of the physical, actual realm are irrelevant to whether or not the law of plenitude is satisfied. And because the hypothesis is interpreted in terms of counterparts, it makes no claims about the gravitational interactions of *our* Mercury and sun, no claims that can come into conflict with the contingent empirical facts.

The second problem for maximalism—the problem Eklund takes to be more serious—is a version of the *bad company objection* that has been leveled against the neo-Fregean's use of abstraction principles. There are abstraction principles, such as Hume's Principle, that can only be satisfied in an infinite domain; and there are abstraction principles, such as Boolos's Parity Principle, that can only be satisfied in a finite domain. (See Boolos 1990.) Both principles are consistent. So maximalism requires that reality be both infinite and finite. Not good. But, of course, plenitudinous realism skirts this problem by invoking a relative notion of truth. The law

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[53] Restall (2003) argues that Balaguer's plenitudinous platonism falls victim to this problem.

of plenitude says only that each of these principles is true *of some portion of reality*, not *reality as a whole*. And there is no contradiction in holding that some portions of reality are finite while other portions are infinite. (Compare the treatment of non-Euclidean geometry in Section 2.)

Eklund goes on to consider examples involving what he calls *incompatible objects*; and these examples might, at first glance, appear to be more worrying for the plenitudinous realist. Suppose that it is consistent that F's exist and it is consistent that G's exist, but it is not consistent that F's and G's co-exist. Then the F's and the G's are what Eklund calls "incompatible objects." Incompatible objects are, indeed, a problem for maximalism. But perhaps plenitudinous realism is threatened by them as well, even though it invokes a relative notion of truth. For, according to the law of plenitude, the F's exist in some portion of reality, R, and the G's exist in some portion of reality, S. Now consider the portion of reality that is their fusion, R+S. Don't the F's and G's coexist in this portion of reality, thereby contradicting the supposed incompatibility of F's and G's?

To solve this conundrum, we need to note an ambiguity in the characterization of "incompatible objects." When we say, an F cannot coexist with a G, do we give F and G wide scope or narrow scope? If we give them wide scope, we get: for any x that is an F and any y that is a G, necessarily, x and y do not coexist. Then any F and any G are indeed incompatible *objects*. But if we give F and G narrow scope, we get instead: necessarily, there does not exist both an F and a G. In this case we might better say that F and G are incompatible *sortals*. Let us take these two readings in turn. The plenitudinous realist simply denies that there are incompatible *objects*. Let *a* be an F that is part of R and *b* be a G that is part of S. Then, *a* and *b* are also a part of R+S, and so co-exist in R+S (as well as in reality as a whole). *a* may not be an F in R+S, nor *b* a G. But in asking whether *a* and *b* are incompatible *objects*, we are concerned with the objects themselves, independently of how they are picked out.[54] On the other hand, the plenitudinous realist will allow that there are incompatible *sortals*, where sortals F and G are incompatible just in case there is no portion of reality of which it is true to say both that there is an F and that there is a G. In particular, if F or G contains an explicit or implicit universal

[54] Alternatively, we might understand "incompatible" in terms of (intrinsic) duplicates, as with Humean recombination principles; see Bricker (forthcoming b) and below. The plenitudinous realist will also deny that there are incompatible objects in this sense. For any F and any G, there is a world where a duplicate of that F co-exists with a duplicate of that G.

component, then F and G may be incompatible. For although the truth of purely existential propositions is preserved under expansions, the truth of purely or partly universal propositions is not. Consider the following illustration. Let F apply to objects that are spatiotemporally related to everything and let G apply to objects that are spatiotemporally related to nothing. *That there is an F* and *that there is a G* are both consistent propositions, the former true in spatiotemporal worlds, the latter true in worlds with no spacetime. But there is no world or portion of reality in which both these propositions are true. Such incompatible sortals, however, make no trouble for the plenitudinous realist. They just provide an illustration of something we knew all along, namely, that the consistency of propositions isn't preserved under conjunction.

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The main challenge for plenitudinous realism is to say what the principles of the framework are, and then to justify that choice. The latter project is tantamount to providing an epistemology for the principles I take to be *a priori*. As an absolutist, I am prohibited from invoking pragmatic criteria in justifying these principles. For, applying my strategy for avoiding parochialism, I would then have to allow that there are alternative coherent frameworks, each with its own principles true of its own portion of a bigger reality. And because I would need a meta-framework to make sense of the alternative frameworks, I would be off on a vicious regress. So the project of justifying the principles of the framework is urgent, to be sure. But here I set it aside and just say something about which principles I accept. That will allow me to say something about which metaphysical theories I take to be absolutely necessary—built into the framework—and which metaphysical theories I take to be contingent—true of some portions of reality but not others.

For the plenitudinous realist, different choices of principles for the framework lead to substantially different commitments as to the nature of reality. At one extreme, we might leave out some or all of the principles of classical logic, thus allowing that alternative logics are somehow coherent, each holding in some portion of reality. Towards the other extreme, we might take all of mathematics to follow from principles of the framework, thus rejecting plenitudinous *platonism*. Or, going farther, we might take our laws of nature to be principles of the framework, allowing only for a very limited version of modal realism. I do not find these extreme positions plausible, or well motivated. But there is a lot of middle ground over which plenitudinous realists may tussle. More liberal philosophers include less in the framework, thereby allowing more to be coherent, or in some sense contingent. More conservative philosophers include more in the framework, thereby taking more to be incoherent. As a Humean, I find myself towards the conservative end of this scale. In what follows, I say a few words about the principles I include in the framework, and then illustrate where I stand with respect to some controversial theories.

The framework I accept starts with what Lewis (1993) calls "megethology," which adds to the logical apparatus of truth functions, identity, and singular quantification the apparatus of plural quantification and mereology. But, unlike Lewis, I also include higher-order plural quantification: quantification over pluralities of pluralities, and on up the hierarchy. And, because I accept (a moderate version of) composition as identity, I take a generalized identity relation—*being the same portion of reality as*—as my single mereological primitive. (See Bricker 2016.) In stating the principles of logic, I help myself to quantification over (abundant) propositions, properties, and relations, and to primitive logical notions that apply to these entities. Although these logical notions are ideological primitives of the framework, I take it as a working hypothesis that "intensional entities" and the logical notions that apply to them can be ontologically reduced to the particulars that make up reality. What is ideologically basic to our representation of reality need not be ontologically basic. The principles of logic and mereology that I include in the framework won't be stated here. It suffices to note that their implications are classical through and through.

Next I add to the framework a primitive notion of *being (perfectly) natural*, or *being fundamental*, that applies to properties and relations.[55] As noted in the paper, I apply naturalness to mathematical properties and relations no less than physical properties and relations; for it is the natural properties and relations that make mathematical and physical reality intrinsically structured.[56] The structure of a portion of reality, be it a mathematical system or a possible world, is determined by the distribution of natural properties and relations over that portion of

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[55] I hold, as a second working hypothesis, that a notion of relative naturalness, or fundamentality, can then be defined using logic. Should this project fail, relative naturalness would need to be taken as primitive.

[56] On Lewis's (1991, 1993) structuralist interpretation of mathematics, the truth of mathematics depends only on the size of reality: how or whether reality is (intrinsically) structured is irrelevant. This might aptly be called "structuralism without structure." As I said in the paper, I do not think that it gives a plausible interpretation of mathematical theories.

reality; it is the *pattern* of natural properties and relations. So, with a primitive notion of naturalness in hand, we can define the notion of structure.[57] We can also define the notion of being an intrinsic duplicate, and the notions of internal and external relations, notions that will be needed to state the principles of the framework. (For the standard definitions, see Lewis 1986a: 61-2.)

Two points of clarification are important. First, although I apply 'natural' and 'fundamental' only to properties and relations, I don't thereby mean to exclude "intensional" entities of other or higher type; it is just that my preferred framework is a categorial grammar according which all components of (structured) propositions are either individuals or properties/relations. But I *do* mean to exclude individuals: I do not think there is any distinction among individuals of being more or less natural, or more or less fundamental, that is not derivative from the naturalness of the properties/relations they instantiate. In particular, I do not take parts to be more fundamental than the wholes that they compose simply in virtue of being parts. Second, it is important to distinguish different ways that properties or relations may be fundamental. They may be *ideologically* basic, or *ontologically* basic. The notions that are needed to express the principles of the framework count as ideologically basic. They are fundamental to our representation of reality, but need not be fundamental to reality itself. These two ways of being fundamental cut across one another. For example, I would say that the truth functions and quantifiers are ideologically basic, but not ontologically basic; "fundamental" physical properties and relations (mass, distance) and mathematical relations (successor) are ontologically basic, but not ideologically basic (because the principles of the framework are

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[57] Two portions of reality r_1 and r_2 *have the same structure* iff there is a one-one mapping φ between their parts and a one-one mapping ψ between the perfectly natural properties and relations instantiated in r_1 and the perfectly natural properties and relations instantiated in r_2 such that (to take the case of a dyadic relation) for any relation R instantiated in r_1 and any parts x and y of r_1, x bears R to y iff ϕx bears ψR to φy. Note that we will need a principle of the framework that tells us which defined properties and relations are perfectly natural. Example: I take it that for any structure picked out by the earlier-than relation, the same structure could instead by picked out by the later-than relation. To get that result, we need to know that whenever a relation is perfectly natural, so is its converse. (Here, I am rejecting Lewis's claim that the natural properties are a minimal supervenience base; see Lewis 1986a: 60). Intuitively, if the definition is in no way disjunctive, then the perfect naturalness of the components of the *definiens* is transferred to the *definiendum*. But it is no trivial matter to state the required principle rigorously, and in full generality.

general, and quantify over these properties and relations); the primitive relations of mereology and plural logic—*is the same portion of reality as* and *is one of* —are both ideologically and ontologically basic. I do not think that these different ways of being fundamental amount to different conceptions of fundamentality, or naturalness. But it is important to keep the distinction in mind when asking how what we take to be fundamental is relevant to the structure and scope of reality itself. (See Bricker 2019.)

Among the principles of the framework that go beyond megethology are Humean principles of plenitude. I need principles strong enough to undergird all the various applications of Hume's dictum, that there are no necessary connections between distinct existents. I divide these principles into three sorts. (See Bricker (forthcoming b) for more precise formulations; here they are generalized to apply to reality as a whole, not just the realm of *possibilia*, and to apply to any sort of mathematical structure, not just spatiotemporal structure.) In stating these principles, I make use of the notion of an *island of reality*: a maximal unified portion of reality. Islands may be unified by any external relation, and each island is absolutely isolated from every other: no inhabitant of an island stands in any external relation to anything not on the island. Possible worlds and mathematical systems are, I claim, the prime examples of islands of reality. (See Bricker (1996) for arguments, and precise definitions.) Now for the principles. First, we need a principle of recombination such as the following:

> (R) For any things, however scattered throughout reality, and any way those things could be arranged, there is an island of reality inhabited by duplicates of those things arranged in that way.

Second, we need a principle of plenitude guaranteeing the existence of aliens, what I call a principle of plenitude for contents. (In Bricker (forthcoming b), I call this the *principle of alien individuals*.)

> (A) Consider any thing and the island of reality it inhabits. There is another island of reality exactly like the first island except that the thing has been replaced by something alien to the first island.

Third, we need a principle of plenitude for structures, a principle that tells us what structures are instantiated by islands of reality. In Bricker (1991), I consider principles that tell us what structures are instantiated by *possible worlds*. But the principle I accept is simpler if we can ignore whether the island of reality is properly called a "world." I accept:

> (S) For any structure compatible with the framework[58], there is an island of reality that has (exactly) that structure.

Principle (S) is behind my claim in the paper that, not only is any coherent theory true of some portion of reality, but true of some portion of reality *that matches the theory*. These three principles of plenitude work together to ensure that Hume's dictum will be in full force.

I need also to mention a (meta-)principle that constrains what primitives can be added to the framework. Goodman (1966: 36) expressed it this way: "There cannot be difference of entities without difference of content." Understanding the "content" of an entity to be the entities that it, in some sense, is composed of, we can take Goodman's principle to be this:

> (G) For any mode of composition, numerically distinct entities are never composed of the same elements.

The instance of (G) that applies to *mereological* composition is already a principle (or theorem) of the framework: mereological composition is unique. But (G) tells us more; it tells us that the framework can brook no *non*-mereological mode of composition that fails to be unique. Strictly speaking, (G) does not rule out a non-mereological mode of composition if it satisfies uniqueness. But, even if there were a plausible example of such[59], I do not think it could be included together with mereological composition as part of the framework. For the disjunction of two modes of composition would itself be a mode of composition that violates uniqueness. Thus, as I understand (G), it rules out adding any non-mereological compositional primitives to the framework. Mereology is the only mode of composition.

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[58] How the framework is relevant to what structures are possible comes out in the final section below.

[59] The operation that forms classes from their members might be taken to be a non-mereological mode of composition that satisfies uniqueness. But if the relation *is composed of* must be transitive, as I am inclined to say, then classes are composed, not of their members, but of their urelements; and the operation that generates the classes is the transitive closure of the membership relation.

I consider (G) to be part of my Humeanism. Following Lewis (2001: 611), I take (G) and the Humean dictum to be inextricably linked. The necessary connections that come with non-mereological modes of composition do not get a free pass by labeling them "constitutional"; they are not thereby made intelligible. But Humeanism is a big tent; and many philosophers who are Humean in other respects will not follow me in accepting (G). It conflicts, or at least appears to conflict, with the acceptance of entities they hold dear: maybe classes, or structural universals, or states of affairs. (G) is sometimes associated more with "nominalism" than with Humeanism, perhaps because of its link to Goodman. But that isn't quite right either: a philosopher who accepts simple universals while rejecting structural universals and states of affairs need not run afoul of (G). In any case, however classified, (G) is a powerful principle with significant consequences for the nature of reality.[60]

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I have provided only a partial characterization of the framework and its principles. But enough has been put in place to take up some familiar metaphysical controversies, for example, over the existence of "intensional entities," of classes, of universals, and of emergent properties. I begin with theories of "intensional entities." As I noted in the paper, I am a *pluralist*: I accept abundant and sparse conceptions; structured and unstructured conceptions; extensional, intensional, and hyperintensional conceptions. (See Bricker 1996.) For the pluralist, these different conceptions are not in conflict with one another. But in this case the avoidance of conflict does not derive from an application of the law of plenitude. It is not that the different conceptions apply to different portions of reality. Rather, all the conceptions apply to all portions of reality. For any portion, we can ask what abundant or sparse properties are instantiated there, and we can take the instantiated abundant properties to be either structured or unstructured, intensional or hyperintensional. In this case, we avoid conflict the old-fashioned way: we disambiguate. The conceptions do not conflict because they do not mean the same thing by 'property'.

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[60] Goodman's principle, it seems to me, is more often implicitly relied on than explicitly endorsed; see, for example, the literature rejecting coincident entities. Lewis (1986c: 92) is explicit: "there is only one mode of composition; and it is such that, for given parts, only one whole is composed of them." Lewis (1991) also explicitly endorses the principle, but emphasizes that it doesn't rule out his mereological account of classes according to which the singleton relation is primitive: a singleton is nowise *composed* of its member. Van Cleve (2008) also explicitly endorses the principle.

In the paper to which this is a postscript, I should have been more careful to distinguish between two types of coherent metaphysical theory. In both cases, in virtue of being coherent the theory is true of some portion of reality. But some coherent theories are true of the whole of reality, such as general theories of propositions or possible worlds; these theories may themselves be taken to be, or follow from, principles of the framework. Other coherent metaphysical theories are true only of some smaller portion of reality, such as contingent theories describing the structure, or laws, or qualitative character of some world or plurality of worlds. Now, because quantification over propositions and other "intensional entities" will be needed to state the principles of logic (see Bricker forthcoming a: §3), it follows that a theory of "intensional entities" will need to follow from the principles of the framework. That raises the question: what constraints should be imposed on the *interpretation* of this theory?

When I include some theory as part of the framework, I mean to commit myself to a *realist* interpretation of that theory. Take the case of propositions. It is not enough to make our discourse about propositions true by means, say, of a fictionalist paraphrase that shirks ontological commitment. The quantifiers over propositions must be taken to be objectual, and objectual quantification, I hold, is ontologically committing. That leaves open whether the propositions, under a given conception, should be taken as basic or ontologically reduced to other entities. But the former avenue is closed off: taking propositions to be basic would conflict with Humean principles of plenitude, as Lewis (1986a: 176-91) convincingly argued in his critique of magical ersatzism. The relation that holds between a proposition and what makes that proposition true holds with absolute necessity. But if this argument against taking intensional entities to be basic is accepted, then the judgment that the theory is coherent is held hostage to there being an acceptable ontological reduction. As I note in Bricker (forthcoming a), I take it as a working hypothesis that there is some such reduction of what I call the realm of representation to the reality of things. For example, abundant unstructured propositions may be taken to be classes of portions of reality, and abundant structured propositions may be taken to be more complex class-theoretic constructions in familiar ways. But that brings us straightway to the problem of the existence of classes. For without classes (or other class-like entities), it is hard to see how the reduction could succeed.

* * *

It is common indeed to include a theory of classes (or sets) among the principles of the framework. But I do not think that theories of classes, as ordinarily understood, are coherent. Classes, no less than propositions, make trouble for Humeans. They are up to their neck in illicit necessary connections. For, surely, as classes are ordinarily understood, I cannot exist without my singleton existing, nor can my singleton exist without me. Nonetheless, a great many Humeans unreflectively accept classes. And even those Humeans who renounce classes do so on grounds of their being abstract, or causally isolated from the concrete realm, not on explicitly Humean grounds. How do they justify excluding classes from the Humean denial of necessary connections?

Humean apologists for classes take various lines. Most common, I suppose, is to hold that classes are composed in some non-mereological way from their urelements, thereby rejecting (G). On this approach, a class and its members are not, in the relevant sense, "distinct." Hume's dictum, they then claim, with 'distinct' properly understood, is no threat to classes; the necessary connections are harmless, indeed, to be expected.[61] This defense of classes seems rather strained when applied to singletons: how does it make sense to say that a singleton is composed, even non-mereologically, of its sole member? But let me set this problem aside, stipulating that 'mode of composition' as it occurs in (G) ranges over purported modes that allow one thing to be the sole component of another thing. With that stipulation in place, I cannot fault this reply if made by a self-proclaimed Humean who rejects (G). I can only repeat what I claimed above: a full-blooded Humean should accept (G).

Lewis (1991: 36-8) takes a different line. He concedes that singletons are mysterious, that if we understand the singleton relation, we know not how we do it. But he nonetheless accepts the singleton relation as primitive, and uses it to formulate principles of the framework. He also accepts (G), and therefore accepts Hume's dictum in its strengthened form: there are no necessary connections between *mereologically* distinct existents. Moreover, since singletons for Lewis are mereological atoms, there is no question but that a singleton *is* mereologically distinct from its sole member. Why then does he not take the necessary connections that accompany the singleton relation to be Humeanly objectionable? Lewis's strategy is this. Humean principles of

[61] See Wilson (2010: 600-4) who in effect takes it to be a requirement on an adequate interpretation of "Hume's dictum" that 'distinct' be understood in a way that does not rule out classes, or other entities that involve "constitutional necessities."

plenitude are violated only if a singleton is necessarily connected to the intrinsic nature of its member, whereas a singleton is instead necessarily connected to the member itself. The necessity involved is thus necessity *de re*, and for Lewis necessity *de re* is not objectionable when interpreted in terms of counterpart theory. For example, the Humean who accepts counterpart theory can allow that I could not exist without my parents by holding that any world that contains a counterpart of me also contains counterparts of my parents; that does not violate any Humean principle of recombination. Similarly, Lewis claimed, the Humean can allow that I cannot exist without my singleton by holding that any world that contains a counterpart of me also contains a counterpart of my singleton. The flexibility of counterpart theory will guarantee that counterparts can be assigned in a way that makes that true (or, if preferred, true in some contexts and false in others). In short: Humean principles rule out necessary connections between the intrinsic natures of things not the things themselves. That is why, Lewis thought, the necessary connections accompanying the singleton relation did not violate Hume's dictum.[62]

I do not think, however, that this defense of singletons succeeds. It is not enough to hold that there is *some* interpretation of the necessity involved under which the necessary connections are Humeanly acceptable. One must show that there are no violations of Humean principles *however* the necessity is interpreted. Granted, one cannot evaluate whether violations occur without making some assumptions as to the intrinsic nature of singletons. But if there are violations on all plausible assumptions, then singletons—and classes generally—are in trouble.

Consider first (A), the principle of plenitude that guarantees aliens. Because the singleton relation is external, a thing and its singleton inhabit the same island of reality. Applying (A) to the singleton results in a different island that contains a duplicate of the thing but no duplicate of the singleton. And this conflicts with the following plausible assumption: singletons of duplicates are themselves duplicates. This assumption will hold if a singleton inherits the intrinsic character of its member, or if a singleton has no substantial intrinsic character at all. The only way the principle could fail, it seems, is if the intrinsic nature of a singleton depends on its particular member; and that would violate the Lewisian understanding that intrinsic natures are

[62] There was still the problem of how we could possibly understand the singleton relation. Not long after publishing *Parts of Classes*, Lewis inclined more towards a structuralist account of singletons. See Lewis (1993).

purely qualitative. It seems, then, that classes run into Humean trouble that no resort to counterpart theory can obviate.

Consider next (S), the principle of plenitude for structures. Start with any island of reality that contains a thing and its singleton. Consider the structure that applies to just the individuals—that is, the non-classes—that inhabit the island. Applying (S), we have an island of reality that has exactly that structure, and therefore where the individuals have no singletons at all. This conflicts with the assumption, made by Lewis (1991) and all standard class theorists, that every individual has a singleton. Again, Humean principles of plenitude make trouble for theories of classes that no resort to counterpart theory can obviate.

None of this, however, is a problem for purely *mathematical* theories of classes, not if one accepts the structuralist claim, as I do, that mathematics is concerned only with structure. As I noted in the paper, there will be islands of reality—mathematical systems—where second-order Zermelo-Fraenkel set theory is true, islands that differ in size. Moreover, for any cardinal number κ, there will islands of reality where Zermelo-Fraenkel set theory with κ urelements is true. If we let κ be the number of parts of our physical universe, we can use principles of plenitude to get an island of reality, one part of which is a duplicate of our physical universe, the rest of which is a "superstructure" of "classes" satisfying Zermelo-Fraenkel set theory with κ urelements.[63] But no purely structural account of classes can do the work required of philosophical theories of classes. Take, for example, the identification of abundant properties with classes. Abundant properties are instantiated by things inhabiting different islands, different worlds. But no purely structural account can allow classes to have members from different islands. The Humean who wants to invoke classes for purposes of ontological reduction will need a different approach.

There is a different approach, one that allows the Humean to accept our ordinary conception of classes and the necessary connections that come with them. As I mentioned above, I take the framework of megethology to include higher-order plural quantification. I propose, then, to understand classes as pluralities of individuals, and classes of classes as pluralities of

[63] How do we know whether or not we inhabit a physical universe with such a superstructure of "classes"? We don't. The superstructure makes no difference to any observation we could make; it is causally and explanatorily inert. But ignorance of this sort is a feature, not a bug. It is only to be expected once one embraces plenitudinous realism.

pluralities, and so on up the hierarchy all the way into the transfinite. On this account, there is no problem saying that classes have members taken from different islands of reality, for "being a member" is just the logical relation "is one of," not a mathematical or structural relation. And there is no longer any mystery over the necessary connections. My singleton is not distinct from me. The difference between me and my singleton, so to speak, is a difference in modes of referring to a single entity. Wherever I go, so goes my singleton because wherever I go, so goes the possibility of referring to me using either singular or plural modes of reference. Since I am identical with my singleton, there is obviously no objectionable necessary connection, no violation of Hume's dictum. Note that what I am proposing is a thoroughly realist interpretation of theories of classes; it is not some sort of eliminativist paraphrase. Plural quantifiers, no less than singular quantifiers, are ontologically committing. But plural quantification over individuals—even of higher order—is not committed to anything beyond the individuals themselves.[64] Classes exist, sure enough, but they are not controversial abstract entities, not if one rejects the singularist dogma that plural quantification is just quantification over classes, or class-like entities.[65]

* * *

With classes resurrected, I move now to our third topic: the coherence of universals. In Bricker (forthcoming a), I plumped for an account of reality that grounded the qualitative character of things in tropes, not universals; everything that exists is particular. But if theories of universals are coherent no less than theories of tropes, the law of plenitude demands that there be portions of reality where things instantiate universals. Indeed, reality will divide into regions with universals but no tropes, regions with tropes but no universals, and regions with both. One could choose to *accept* a theory of tropes on pragmatic grounds. But, for the plenitudinous realist, that would be a decision to ignore universals, not a reason to excise universals form reality.

But I do not think that theories of universals are coherent. One problem afflicts theories that posit *structural universals*. Structural universals involve some non-mereological mode of composition; I deem them incoherent in virtue of violating (G). (See Lewis 1986b.) But the

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[64] Though it may be committed to the individuals in different ways; see Rayo (2007: 435-7) on what he calls "plethological commitment."

[65] Rayo (2006) gives one way of developing this sort of approach. I hope to present my own account elsewhere. There are land mines that need to be carefully avoided.

incoherence goes deeper, afflicting the simple universals themselves; and the violations involve the core Humean principles of plenitude, not the principle (G) that many Humeans do not accept. The problem comes from the very idea that universals are immanent, that they are part of reality. That requires characterizing them either as "multiply located" or "wholly present" in their instances. Either way, the universals theorist must be an *ontological dualist*: either she must posit, in addition to the ontological category of universals, an ontological category of locations (whether spatiotemporal or something more general), allowing distinct locations to be "occupied" by the same universal; or she must posit an ontological category of particulars, allowing distinct particulars to be "tied" by instantiation to the same universal.[66]

That leads to a rather flatfooted argument against universals based on the principle of recombination (R): there would have to be portions of reality, for example, where particulars occupy universals, or where universals instantiate particulars. But that argument, I think, is rather weak. It is only to be expected that a Humean that was an ontological dualist would need to restrict (R) to "category-preserving" arrangements. It is enough that the Humean allows all particulars to freely recombine with one another and all (monadic) universals to freely recombine with one another, without also allowing particulars and universals to freely recombine. Indeed, I am an ontological dualist: I accept a categorial distinction between the actual and the merely possible. (See Bricker 2006.) But I take the distribution of actuality over reality to be brute; it is not determined by applying a principle of recombination. Recombination, I hold, applies only to qualitative properties, and the property of actuality is not qualitative.

The incoherence of universals on my account has a different source: it arises because in applying (R) to universals, it is the universals themselves that are recombined at other worlds, not their duplicates. Indeed, it is constitutive of universals that they have no qualitative duplicates. That leads to a conflict with the principle of plenitude for structures (S). For according to (S), reality divides into absolutely isolated regions—islands of reality—that do not overlap. Different structures are instantiated by distinct islands. (See Bricker 1996.) Consider one such island and a universal U located there. By (R), U will also be located in other islands.

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[66] It would take me too far afield to say why I do not think a "bundle theory" of universals is compatible with the idea that universals are "multiply located." In any case, retreating to a bundle theory would only escape the argument from recombination below, not the argument from isolation.

But then the islands overlap one another, and so are not islands after all, contradicting (S). I conclude that the Humean account of plenitude that I accept as part of the framework is incompatible with immanent universals.

* * *

I conclude with a case that swings the other way, a case where I am quite liberal with respect to the framework. First, note that all of the theories considered in the paper involved *singular* predicates, that is, predicates all of whose argument places are singular. When these theories are naturally instantiated by some domain—some portion of reality—the instantiating natural properties and relations are singular as well. The entities that instantiate these properties and relations, of course, may be *composite.* Thus, the law of plenitude already requires that there be emergent natural properties instantiated in reality, where a natural property is *emergent* iff its instantiation by a whole does not depend on the instantiation of natural properties and relations among its proper parts. There will be coherent theories that posit emergent natural properties. But so far there is nothing surprising: emergent natural properties are widely taken to be metaphysically possible, indeed, even actual on many interpretations of quantum mechanics.

When an emergent property is singular, the different ways that a whole can be decomposed into proper parts is irrelevant to the instantiation of the property by the whole. But now consider theories that involve *plural* predicates, predicates some of whose argument places are plural. It is a consequence of my acceptance of plural logic in the framework that there are such theories. When these theories are naturally instantiated by some portion of reality, some of the instantiating natural properties and relations are irreducibly plural. The law of plenitude will require that there be emergent natural properties instantiated in reality that are *slice-sensitive*, that apply to one plurality and not another, even though these pluralities have the same fusion, are the same portion of reality. There will be coherent theories that posit slice-sensitive fundamental properties, and that, I think, has far-reaching consequences. For example, I argue in Bricker (2019) that the possibility of slice-sensitive fundamental properties (or relations) is a reason why strong versions of composition as identity should be rejected. For such properties require that the distinction between singular and plural is not just a matter of how we represent reality, but a feature of reality itself.

* * *

The four examples presented here have, I hope, given a taste of the power of the Humean framework, both to rule out widely accepted theories as incoherent, and to allow for possibilities that go beyond what we ordinarily take to be possible. For the plenitudinous realist, these are not mere possibilities in some abstract sense. They are concretely realized in the vast expanse of reality.

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