Sider on the Epistemology of Structure

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Theodore Sider's *Writing the Book of the World* is an impressive contribution to metaphysics, meta-metaphysics, and general metaphilosophy.[1] In the book Sider develops a general meta-metaphysical theory and applies it in a wide range of philosophical domains.

The book introduces and employs a new primitive notion: *structure* or *joint-carvingness*. Sider's notion of (metaphysical) structure is a generalization of David Lewis's notion of *naturalness*. Lewisian naturalness is a property of properties the sharing of which makes for objective similarity. So if Δ is a natural property then if α and β share the property Δ then α and β *go together* in some objective sense.[2] This means that the similarity between α and β isn't a mere projection of our idiosyncratic conceptual scheme as it would be if the shared property were *being located in Ohio*.

For Lewis, a property is just a set of possible objects; for every sortal predicate G there will be a property expressed by G.[3] Although Lewis's theory of naturalness is bound up with his idiosyncratic metaphysics of properties, the point of the notion is to allow us to distinguish between ways of classifying things that are natural and ways of classifying things that are gerrymandered and *ad hoc*. Even metaphysicians who reject talk of properties or sets or possibilia should be allowed the resources to make this kind of distinction. Accordingly, let's say that a predicate F is *natural* just in case when α and β are both F, then α and β *go together* in some objective sense.

Lewisian naturalness, so understood, allows us to sort our predicates into those that carve nature's joints and those that don't, but our conceptual scheme isn't limited to predicates, and we might wonder whether other conceptual

[1] Sider (2011).

[2] I'm simplifying somewhat; Lewis prefers a graded notion of *naturalness*. See Lewis (1983) and (1984)—in his theory of natural properties Lewis was heavily influenced by Armstrong (1978).

[3] If our language is countable and there are infinitely many possible objects, then the converse will not hold. It's also worth noting that I'm ignoring the issues presented by the paradoxes and hyperintensionality here.

choices can likewise do a better or worse job of reflecting the objective world: this is where Sider's notion of structure comes in. Unlike Lewisian naturalness, structure applies not just to predicates, but to expressions of any grammatical category whatsoever. Structure allows us to ask which quantifiers, predicates, connectives, operators, etc. carve reality at the joints. So by using Sider's notion, we can say that the standard existential quantifier carves at the joints but the $\aleph_{217}$-many quantifier doesn't. Or we could say that conjunction expressions carve at the joints but disjunction expressions don't. Structure allows us to talk in a completely general way about the concepts with which we investigate the world and their relation to objective reality.[4] Because of this, Siderean structure isn't just a minor variation on Lewisian themes, rather, it's a bold and creative extension of the philosopher's toolkit.[5]

Sider's book abounds in interesting applications of structure, but his principle concerns are metaphysical and meta-metaphysical: he thinks that the jointcarving notions are those with which the book of the world is written. This metaphor gives his book its title and highlights the importance of structure to the metaphysical realist. The content of the metaphor is that a theory of the world cast in jointcarving terms is *objectively* better than a theory cast in non-jointcarving terms. This is so even if the two theories are equivalent in some sense.[6]

In Sider's hands, structure saves substantive metaphysical inquiry from the sniping of deflationary critics like Rudolf Carnap, Hilary Putnam, and Eli Hirsch.[7] These critics claim that metaphysical disputes concern artifactual puzzles that fall out of our parochial conceptual choices. The critic denies that analytic metaphysicians are in any real way engaged in finding out about the world. To this, Sider responds: some conceptual choices are objectively better than others. Finding out about the world isn't just a matter of finding some empirically adequate theory, nor is it just a matter of finding a true and comprehensive theory: it's also a matter of our conceptual choices reflecting reality's in-built, mind-independent, objective structure.[8]

[4]Throughout the paper I will use terms like "concept" and "notion" interchangeably.

[5]Sider's book develops and refines ideas that appeared in some of his earlier work, e.g., the introduction to Sider (2001).

[6]Some might question the move from (*i*) the world having a distinguished structure to (*ii*) there being a privileged description of reality; see Hirsch (1993) and Hirsch (2013). Still, there is a sense in which, once structure is accepted, one description of reality (the one cast in jointcarving terms) will be *metaphysically* privileged whether or not there is normative pressure on us to employ this description.

[7]See Carnap (1950), Putnam (2004), and Hirsch (2011).

[8]Obviously this is just a sketch of Sider's detailed response to deflationary metaontologists:

If Sider is right, structure is an important notion in metaphysics and general philosophy. But the notion won't be of much use if it isn't epistemologically tractable. How do we determine which of the many notions dreamt of in our philosophy, carve nature at the joints?

1 The Epistemology of Structure

Sider's remarks on the epistemology of structure are few but suggestive:

> ...as a general epistemology of metaphysics I prefer the vague, vaguely Quinean, thought that metaphysics is continuous with science. We employ many of the same criteria—whatever those are—for theory choice within metaphysics that we employ outside of metaphysics.[9]

Sider builds upon this suggestion by connecting the proposed methodology directly to his notion of structure:

> A good theory isn't merely likely to be *true.* Its ideology is also likely to carve at the joints. For the conceptual decisions made in adopting that theory—and not just the theory's ontology—were vindicated; those conceptual decisions also took part in a theoretical success, and also inherit a borrowed luster. So we can add to the Quinean advice: regard the ideology of your best theory as carving at the joints. We have defeasible reason to believe that the conceptual decisions of successful theories correspond to something real: reality's structure.[10]

The *ideology* of a theory consists of the theory's primitive notions (including logical and mathematical notions). So, for example, the ideology of standard set theory includes the membership relation, expressed by "$\in$" and the ideology of sentential logic includes the connectives in some truth-functionally complete set, e.g., conjunction ("$\wedge$") and negation ("$\neg$"). Sider thinks that theory choice involves honing in on the proper ideology:

> We solve for the best and most explanatory pair $< I, T_I >$ of ideology I and theory T_I in terms of that ideology. We do not hold fixed our

see chapters 5 and 9 of Sider (2011) for the full story. It's also worth noting that there are substantial differences between the views of Carnap, Putnam, and Hirsch.

[9] Sider (2011), page 12.

[10] Sider (2011), page 12.

> initial ideological choices ('fire', 'air', 'water',...) since there may be limits to how good a theory can be formulated in those terms. Many of the most dramatic advances in science are ideological; a new ideology (such as Minkowskian spacetime) can dissolve intractable problems and enable new, more powerful theories.[11]

Sider's remarks suggest roughly the following epistemology of structure: find our best total theory of the world T and believe that T's primitive ideology carves nature's joints. So if T contains conjunction ("$\wedge$"), we should believe that conjunction expressions carve at the joints or, in other words, that the world has conjunction structure. If this proposal works, it makes the epistemology of structure no more or less mysterious than the common principles of theory choice. But I think Sider's proposal faces serious difficulties.

Sider explicitly compares his proposed epistemology for structure to Quine's epistemology for ontology.[12] According to (Sider's reading of) Quine, we should believe in (only) the entities posited by our best overall theory of the world. According to Sider, we should believe in (only) the structure posited by our best overall theory of the world. There is, however, an important difference between the Quinean advice and the Siderean advice. For Quine, ontological claims are quantificational claims, so believing in Xs is sanctioned just in case our best theory of the world entails ⌜there is an X⌝. And since our theories are presented in quantificational terms, the ontological claims Quine enjoins us to endorse *are themselves part of our best theory.*[13] By contrast, our theories of the world are not typically couched in terms of *structure*, so the structural claims Sider enjoins us to endorse are not part of our best theory.

This is a significant and important difference. One half of the Quinean claim follows simply from the injunction to believe in our best theories, but no part of Sider's claim follows from such a platitude.[14] Claims about structure require a new primitive notion for their statement.[15] Because of this, structure

[11] Sider (2011), page 13. In Sider (2013) this procedure is modified to incorporate ideas from Lewis (1970)'s approach to defining theoretical terms, but since I don't think this complication significantly impacts anything I say below, I'll continue to focus on the book's simpler approach.

[12] See Quine (1948).

[13] I am here assuming that the natural language quantifier phrase ⌜there is an X⌝ and its cognates are to be translated into the standard existential quantifier phrase ⌜$\exists x X x$⌝ of first-order logic. If this is denied, the gap between Quine's advice and Sider's advice is somewhat narrowed.

[14] This platitude is not uncontroversial in the philosophy of science but it is generally accepted.

[15] How to regiment talk of structure is something that Sider devotes considerable attention to in the book. The details won't concern us here.

claims aren't directly made by our theories and so the Quinean analogy becomes strained. In itself, perhaps this isn't a serious problem, but it highlights the foreign nature of the structure concept and it should make us a bit uneasy about Sider's Quine-inspired epistemological proposal. Indeed, when we begin to examine the proposal in more detail, more serious issues emerge.

To start this examination, let's first take care to distinguish between *theoretical virtues* and *principles of theory choice*. Generally, something is a theoretical virtue if it is a goodmaking feature of a theory. So, e.g., *being true* is a theoretical virtue and, according to Sider, *being cast in jointcarving terms* is a theoretical virtue. By contrast, principles or criteria of theory choice are used when choosing which theory to accept. Accordingly, properties used in principles of theory choice must be accessible to us. I'm not going to attempt to exhaustively list the principles of theory choice or analyze them, but a property like *empirical adequacy* is used in the widely accepted principles of theory choice "reject any theory that isn't empirically adequate", for example.

Being cast in jointcarving terms, or *jointcarvingness* for short, cannot be a criterion of theory choice if Sider's proposal is to get off of the ground. If jointcarvingness were a principle of theory choice, then in order to determine which notions carved at the joints we would first have to determine which theory was best using our criteria of theory choice. But then in order to determine which theory was best, we would first have to determine, among other things, which theory's primitive notions carved nature at the joints. So if jointcarvingness were a principle of theory choice, Sider's proposed epistemology would be circular and thus unimplementable.[16]

But even taking care to avoid circularity and putting general puzzles about theory choice aside, the combination of Sider's notion of structure with standard principles of theory choice is problematic. Sider's methodology requires that the output of our application of our criteria of theory choice be "theories" for which the notion of primitive ideology makes sense. But on no credible understanding of *scientific theory* is this the case. For a "theory" to have primitive ideology it needs to be cast in a specific language with some terms of the language taken as primitive and others defined in terms of those primitives. So for Sider's proposal to work, scientific theories would need to be something like axiom systems in some specific formal language with designated primitives. But this understanding of "theory" doesn't square with scientific practice, and almost

[16] A similar point is made in Dorr (2013).

all current philosophers of science and scientists reject the idea that scientific theories are axiomatizations in some formal language. Without opting for any particular account of the nature of theories, we can be confident that the notion of "theory" used in science is more expansive than the language-bound notion required by Sider's epistemology.

Since this point is absolutely crucial, it is worth illustrating it with a concrete example drawn from the history of science. Consider the case of Heisenberg's matrix mechanics of 1925 and Schrödinger's wave mechanics of 1926. It is generally accepted that matrix mechanics and wave mechanics are mathematically equivalent. Proofs of this equivalence were offered by Schrödinger, Eckart, Dirac, Pauli, and Von Neumann.[17]Here's Schrödinger on the relationship between the two formalisms:

> In what follows...the *inner connection* between Heisenberg's Quantum Mechanics and my own will be made clear. From the formal mathematical standpoint one may even say that the two theories are identical.[18]

This is despite the fact that these two formal theories (*i*) were developed independently, (*ii*) were initially applied to different physical phenomena, and (*iii*) seem to provide different pictures of physical reality. Here's George Gamow in a popular account of the development of quantum mechanics summing up the situation:

> The unexpected identity of the results obtained by Schrödinger's wave mechanics and Heisenberg's matrix mechanics, which seemed to have nothing in common either in physical assumptions or in mathematical treatment, was explained by Schrödinger in one of his subsequent papers. He succeeded in proving that, unbelievable as it seemed at first, his wave mechanics was mathematically identical with Heisenberg's matrix mechanics, and that, in fact, one could derive either from the other. It was just as surprising as the statement that whales and dolphins are not fish like sharks or herring but animals [*sic*] like elephants or horses! But it was a fact, and today one

[17]Schrödinger's proof seems to have fallen short of a full equivalence proof and similar attempts by Eckart, Pauli, and Dirac are sometimes said to suffer from similar defects, but Von Neumann (1932) is generally agreed to contain a full and correct proof of the equivalence of matrix mechanics and wave mechanics. For discussion see Madrid Casado (2008) and van der Waerdan (1973).

[18]I take this quote from van der Waerdan (1973).

> uses wave-and-matrix mechanics intermittently depending on one's taste and convenience.[19]

So physicists regard matrix and wave mechanics as being completely equivalent or even, in some sense, the same theory, but if Sider's epistemology for structure is to work, they must count as distinct theories.

It is difficult to perfectly formalize the informal notion of mathematical equivalence in advance by giving a single, maximally general technical definition.[20] I won't be attempting to do so here, but clearly: if two theories T_1 and T_2 are mathematically equivalent, then they are completely empirically equivalent. There may be examples of pairs of theories where it isn't clear whether they are mathematically equivalent: are the theories T and $T^* = T$ is false but all empirical consequences of T are correct, mathematically equivalent? We don't need to answer all such questions here. Even leaving almost everything about the notion of mathematical equivalence imprecise, we can clearly work with the informal notion simply by noting that, as the above quotes illustrate, scientific theories are generally understood broadly enough so that pairs of "theories" that are regarded as fully mathematically equivalent are regarded as being, in a more general sense, the same theory. Let's make this a bit more precise.

Logic textbooks define a "theory" as the closure of some set of sentences (the axioms of the theory) under logical consequence, let's call this the *logical* notion of a theory. And let's call the type of theory used in science and mathematics the *scientific* notion of a theory. The problem with Sider's proposed epistemology can now be put starkly: Sider suggests that we use principles of theory choice to determine our best theory and then, with our best theory in hand, go on to believe in the structure corresponding to our best theory's primitive ideology. But the output of applying our principles of theory choice is a *scientific theory*, yet we can only read primitive ideology off of a *logical theory.* To illustrate, consider a (logical) theory T that uses conjunction and negation for its sentential connectives and now consider the theory $T*$ exactly like T except that $T*$ has disjunction and negation as its only sentential connectives and $T*$ translates each claim in T involving conjunction into a truth-functionally equivalent claim involving disjunction and negation. T and $T*$ are obviously equivalent in every way that matters for science, but they are different logical theories and are ideologically different and so, if accepted after applying our principles of theory

[19] Gamow (1966), page 105.

[20] See the appendix to my (2014) for some relevant remarks.

choice, would lead us to form different beliefs about reality's metaphysical structure according to Sider's epistemology. The supposed continuity of Sider-style metaphysics and science cannot be maintained. Sider's epistemological proposal rests on either a non-standard and implausible definition of scientific "theory" or on an equivocation between the scientific and logical senses of "theory".

As far as I'm aware, Sider nowhere addresses this important and highly relevant discontinuity between scientific and metaphysical practice, but in chapter 10 of his book, Sider discusses related issues concerning the variety of truth-functionally complete sets of sentential connectives and superficial and epistemically irrelevant features of our theories, such as what font they are written in:

> The epistemology proposed... instructs us to search for the most explanatory pair $< I, T_I >$ of ideology I and theory T_I in terms of I. A natural concern is that there will be no unique most explanatory pair. My response to the concern is that when pairs are tied, we should be agnostic about which pair is correct (i.e., which is the pair of the joint-carving ideology and the true theory in that ideology).[21]

Sider goes on to argue, rightly I think, that our theories don't come written in some particular font, so superficial features of this kind don't generate new pairs of ideology and theory. However, given what I've argued above, there will be a great many ideology/theory pairs that tie according to our scientific principles of theory choice. If Sider were to adopt the agnosticism endorsed in this quote in all such cases, it would be a wide-ranging agnosticism indeed: for any given theory there will be innumerable mathematically equivalent theories written in a different conceptual notation.[22]

I don't think wide-ranging agnosticism about structure is very appealing for Sider and other metaphysicians, so I'm going to consider three ways for Sider to alter his epistemology in response to the problems I'm raising: (*i*) a supervaluationist-style reply; (*ii*) a subvaluationist-style reply; and (*iii*) a reply that appeals to our criteria for deciding between formulations of a particular the-

[21] Sider (2011), page 221.

[22] As one illustration, Donaldson (2014) has argued, using a well-known result of Quine's that quantifiers and variables can be dispensed with, that Sider cannot claim that quantifiers carve at the joints. The idea is, in my terms, that for any theory using quantifiers there are mathematically equivalent theories that eschew quantifiers entirely that come out equally in terms of principles of theory choice. Donaldson uses this example to raise general issues for Sider's epistemology of structure that are complementary to those I'm raising here. Thanks to an anonymous referee for making me aware of Donaldson's paper.

ory. In order to explain these responses, I need to introduce some terminology: scientific theories are something like (or correspond to) equivalence classes of logical theories under the relation of mathematical equivalence (scientists count logical theories as identical if they are mathematically equivalent). Let's say that a logical theory in the equivalence class corresponding to a given scientific theory T is a *formulation* of T. So the theory formulated by wave mechanics can be formulated as a logical theory in many different mathematically equivalent ways; thanks to the work of numerous physicists, we even know that it can be reformulated in the manner of matrix mechanics. Using theory formulations, let's now consider the replies Sider could make to my objections.

(i) according to a supervaluationist-style response, Sider could take a notion α to be structural just in case our principles of theory choice have delivered scientific theory T and α occurs in *every* formulation of T.[23,24] The problem with this move is that, arguably, *nothing* would count as joint-carving according to this condition. The existential quantifier wouldn't, since it can be defined in terms of negation and universal quantification. And quantifiers themselves wouldn't, since they can be dispensed with in certain feature-placing languages.[25] Scientists would consider all such variations, and many more besides, formulations of the very same theory. If the supervaluationist-style response is adopted, the notion of structure is entirely empty.

(ii) according to a subvaluationist-style response, Sider could take a notion α to be structural just in case our principles of theory choice have delivered scientific theory T and α occurs in *some* formulation of T.[26] The problem with this approach is the inverse to the problem of supervaluationism, viz., *too many* notions end up carving at the joints. If you can rewrite T using some particular notion α, then α carves at the joints. This means, among other things, that virtually every logical notion and mathematical notion carve at the joints. In section 10.2, Sider evinces an openness to this type of liberal approach, at least for the notions of sentential logic, but if applied in full generality, this extreme permissiveness would seem to undercut many of the applications Sider makes

[23]The first two replies are named in analogy to the relevantly similar approaches to vagueness.

[24]Section 7 of Donaldson (2014) considers some related moves on behalf of Sider, see also footnote 26 below.

[25]See again Donaldson (2014)'s discussion.

[26]Donaldson (2014), section 7.2, criticizes something like this subvaluationist approach to structural notions, the difference being that I have framed things in terms of facts about which notions are structural, while his proposal is directly in epistemological terms. Also, Donaldson's criticism of this subvaluationist proposal appeals to a principle of structural completeness that I am not sure can be appropriately imposed upon the Sider-style metaphysician.

of structure. I don't think the extreme pluralism of this approach is a very attractive option for Sider.

(*iii*) a *prima facie* more appealing response attempts to distinguish between the various formulations of scientific theory T to pick out a preferred formulation. If this could be done, we could then go on to believe only in the structure posited by our preferred formulation of T. This avoids the excesses of the previous responses, but it's hard to see how to square this approach with Sider's view of the world, for our reasons for preferring one formulation of a theory over another are almost always *merely* practical. Scientists don't attach any epistemic significance to these practical choices and for good reason, since they are often rooted in contingent and idiosyncratic facts about us, e.g., one theory formulation might be preferred over others simply because it employs a mathematical framework familiar to contemporary scientists. For instance, early twentieth century physicists preferred Schrödinger's version of quantum theory to Heisenberg's partially because the familiar mathematical tools employed by Schrödinger were easier for them to work with. Here's Steven Weinberg on this preference:

> The Schrödinger equation is mathematically the same sort of equation (known as a partial differential equation) that had been used since the nineteenth century to study waves of sound or light. Physicists in the 1920s were already so comfortable with this sort of wave equation that they were able immediately to set about calculating the energies and other properties of all sorts of atoms and molecules.[27]

It would be incredible if parochial facts about human educational backgrounds were relevant in determining what kinds of objective structure reality contains.

In response to this problem, Sider could simply bite the bullet and accept that some choices that seem merely practical can have real epistemic import. There is a prestigious precedent for such a move: Quine himself denied any principled distinction between epistemic and practical reasons.[28] But I don't think this option is very attractive for a metaphysical realist like Sider. Quine was able to reject a firm line between the epistemic and the merely practical because he was a holist empiricist behaviorist pragmatist without any interest in fitting theoretical posits to a God's eye version of reality, but Sider's *entire*

[27] Weinberg (1994), pages 70-71.
[28] See Quine (1951a), (1951b), and (1960).

project concerns discerning the God's eye version of reality![29]

For Quine the only external check upon our theorizing is given by the constant flux of sensory stimulations. By contrast, Sider and many other contemporary analytic metaphysicians are *realists* in the most heavyweight sense imaginable. It's difficult to see how a thoroughgoing Quinean epistemology squares with Sider's robust metaphysical realism. This despite the fact that Sider (and other contemporary metaphysicians) clearheadedly endorse a Quine-style epistemological pragmatism. But despite the post-Lewis appropriation of Quine by Sider and other analytic metaphysicians, one can't coherently be an *epistemological pragmatist* while also being a *metaphysical realist*. The marriage between Quine and substantive metaphysics is doomed to end in a messy and long overdue divorce.[30]

Of course, there have been attempts to combine pragmatism and realism before, e.g, Charles Sanders Peirce famously combined a version of pragmatism with a form of scientific realism by appealing to a final theory of the world that science would converge upon at the end of inquiry.[31] But I don't think that Sider could use this idea, or anything similar, to avoid the problems I've been posing for his epistemology. To assume that science will converge upon a single logical theory at the end of inquiry, in this context, simply avoids all of the relevant epistemological questions. This isn't necessarily a criticism of Peirce though, since it isn't clear that he meant to endorse anything as strong as Sider-style metaphysical realism — the theory accepted at the end of inquiry, for Peirce, may just be a scientific theory, rather than a logical theory. If the problems of combining epistemological pragmatism with metaphysical realism are squarely faced, I don't see any plausible way for a metaphysical realist like Sider to make response (*iii*) work.

If this is right, then Sider's proposed epistemology for structure actually doesn't get us very far. We end up either agnostic about almost all structure claims or endorsing implausible, broad-brush claims about which notions are structural. In order to have a workable epistemology for a useful notion of metaphysical structure, it is imperative that Sider links up our preference for one formulation of a theory over another to the objective facts about structure.

[29] This is just a metaphor; Sider's theory doesn't explicitly include God or any other deities. Though see the final section below for some relevant discussion.

[30] See Price (2009) and Soames (2009) for recent discussions of the oddity of seeing Quine as the savior of analytic metaphysics.

[31] See Peirce (1878); in contemporary philosophy Williams (1978) used something like Peirce's idea in explaining his notion of an "absolute conception" of the world.

Unfortunately for Sider, I think that there are general reasons for thinking that this cannot be done.

2 Principled Reasons for Skepticism

Hardcore versions of realism in non-causal domains like mathematics, logic, and ethics face serious epistemological challenges. In contemporary philosophy, these challenges have been developed into influential epistemological arguments against realism in these domains. The recent philosophical development of these arguments largely takes off from Hartry Field's amendments to an argument from Paul Benacerraf.[32] Sider's realism about metaphysical structure faces this challenge in its starkest form. In other words, we can mount an epistemological argument aiming to show that no satisfying epistemology for metaphysical structure is possible. Here I'll outline this argument.

According to an uncontroversial version of naturalism about cognition, our attitude-forming mechanisms, one and all, are causal mechanisms. This is just to say that they are responsive to causal changes in the world and any change in our attitudes is produced by some causal impact. The notion of *causation* that I'm working with here isn't meant to be controversial, I'm using "causation" as a covering term for any kind of difference-making physical interaction. Theorists who are skeptical of philosophically robust notions of causation should be able to accept naturalism about cognition in the form presented here. There is no inconsistency between accepting naturalism about cognition and accepting Sider's notion of metaphysical structure, but tension appears if we think that any human could have epistemological access to the structure facts.

Let's imagine that some metaphysician, call him "Atticus", is correct in all of his attitudes about structure. This means, at least, that the following two conditions are met:

Reliable Acceptance: For any structure claim p, if Atticus accepts p then it is true that p

Reliable Rejection: For any structure claim p, if Atticus rejects p then it is

[32] See Field (1989)'s comments on Benacerraf (1973) — it is worth noting that Benacerraf was posing a dilemma for any philosophical theory of mathematics, rather than a freestanding argument against mathematical realism. Important contributions to this literature include Balaguer (1995), Clarke-Doane (forthcoming), Enoch (2010), Linnebo (2006), and Schechter (2010).

not true that p[33]

To avoid triviality, let's also assume that Atticus has a significant number of beliefs about which notions are structural. So Atticus is perfectly reliable about structure and all of his cognitive mechanisms are causal. But together these points force us to conclude that Attitcus's reliability about structure isn't due to his cleverness or remarkable insight, but is instead simply a happy coincidence.

The problem is simple: the facts about metaphysical structure are objective, mind independent, and causally inaccessible — it isn't as if we can *perceive* that conjunction is structural but disjunction is not — but Atticus's attitude-forming cognitive mechanisms are, one and all, causal mechanisms, and this seems to preclude any possibility of plausibly accounting for Atticus's structure reliability other than by assuming that he was very lucky in his structure attitudes. Whether we call it "luck", "coincidence", "accident", or something else, the point is the same: there is no robust relationship between Atticus's cognitive mechanisms and the structure facts, so Atticus's reliability about structure is a virtual miracle.

This is the key move in epistemological arguments against this or that brand of realism, but the way that this point is spelled out differs, and frankly, many approaches in the literature are inadequate. Let me briefly indicate how I think things should be spelled out. The problem is that in too many attitude-forming situations that are relevantly similar to the one that Atticus finds himself in, he (Atticus) falls into error about structure. This can happen in two distinct ways: (i) the structure facts differ, but Atticus's beliefs about structure remain the same and so he falls into error; (ii) the structure facts remain the same but Atticus's beliefs about structure differ and thus he falls into error. Much of the literature on epistemological arguments has focused on type-(i) errors, to the detriment of clarity, but for our purposes, type-(ii) errors are more germane.[34]

In section 1 we saw that Sider's epistemology of structure requires that Atticus adopt some particular formulation of our best theory of the world T, and

[33] Historically, rejection has been analyzed as acceptance of negation, but I will be agnostic on this here; for discussion see Ripley (2011).

[34] By focusing only on type-(i) errors, Lewis (1986) was able to argue, in response to Benacerraf (1973), that there was no real epistemological issue concerning domains of necessary truths. Lewis's response has been widely rejected in the literature, but the essential reason — that type-(ii) errors are also relevant — has not been isolated. Type-(i) errors are related to a generalized version of Nozick (1981)'s sensitivity condition on knowledge and type-(ii) errors are related to a generalization of Sosa (1999)'s safety condition on knowledge, but the proponent of the epistemological argument doesn't have to offer either sensitivity or safety as conditions on knowledge.

then believe in the structure corresponding to T's primitive notions in this formulation. We saw there though, that something as contingent and idiosyncratic as educational background often decisively influences one's preference for one formulation of T over another. So say that Atticus adopts a wave mechanics formulation of quantum mechanics and thus has correct beliefs about structure. The problem is that had he taken more linear algebra classes and fewer differential equation classes in college, he would have preferred a matrix mechanics formulation and thus fallen into error about structure. Atticus's reliability about structure is fragile — it is dependent upon contingent factors that could easily have been different. This is what it means to say that he is only reliable by luck or coincidence or accident. Given the implausibility of coincidences of this kind, the natural response is to either reject Sider's realism about structure or to reject Atticus's reliability about structure. Holding on to both of these things is what generates tension. In broad strokes, this is the epistemological argument against Sider's structural realism.

There is disagreement in the literature about the exact features of realism that generate the problem here. Sometimes it is supposed to be the mind-independence of the facts posited by the realist, at others it is the objectivity, in some sense, of the realist's facts. In all cases however, the causal inaccessibility, in some sense, is essential.[35] Nobody thinks there is an epistemological challenge facing realism about ordinary objects, because realism about ordinary objects allows for an explanation of our reliability concerning cognitive mechanisms that are responsive to causal changes in the environment. We are reliable about tables, for example, because we can causally interact with tables and perceive them in fairly direct ways. Presumably we are reliable about electrons by way of causal chains that are much longer and less direct, but none-the-less, causal access to the objects and properties that make up the relevant facts allows us to explain our reliability.

Here I'm not being too fussy about the general features that generate the epistemological problem, since it is overdetermined in this case. Sider's extreme realism about metaphysical structure makes the structure facts acausal, mind-independent, and fully objective according to almost any notion of objectivity that has ever been proposed. For these reasons, the Siderean realist about structure faces the full force of the epistemological arguments. Given the features that Sider's notion of metaphysical structure must have, it seems

[35] As can be gleaned from the above, talk of "facts" here is dispensable.

that metaphysicians could only be correct in their beliefs about structure by getting lucky. This consideration puts serious pressure on any claims made by a metaphysician concerning structure. Given the above, it's unlikely that any particular metaphysician is correct in their beliefs about structure. The problem here is not the skeptical worry that we *could* be wrong, rather, it is the worry that it's hard to see how we could be right except by benefiting from happenstance.

It would be insane to reject basic scientific naturalism in order to save metaphysical structure. If we did so we would be no better than the astrologers and tarot card readers who make analogous moves. Sider could resist this perhaps, arguing that the various applications of metaphysical structure make a non-naturalist, structure-involving view of reality a better bet than a structure-spurning naturalist view. But I think that this too, could be aped by astrologers and tarot card readers. In any case though, I don't think Sider or other friends of structure will be willing to throw away scientific naturalism in order to hold on to metaphysical structure. If the above argument is correct, it's best that we either reject structure or reject our reliability about structure. But it would be more than a bit odd to accept structure facts while denying that we have any epistemological access to said facts. As long as we aren't verificationists, there is nothing incoherent about such a move, but it's pretty strange. So unless there is some very strong reason to hold on to inaccessible structure facts (I consider one purported reason in the next section), we should reject structure.

How should Sider respond to this argument? One knee-jerk response is to claim that structure keeps good company. In other words, Sider could claim that while both mathematics and morality face similar epistemological challenges, we would be crazy to reject mathematics or morality based on some sketchy naturalistic epistemology and so we would likewise be crazy to reject metaphysical structure because of my epistemological challenge. Sider sometimes seems like he might be sympathetic to this type of response, like when he says:

> . . . many of our models of the nature of reasonable—albeit fallible—belief about the external world do not apply straightforwardly to beliefs about more metaphysical matters. For example, we do not seem to be in causal contact with the facts debated by metaphysicians in the same way we are in causal contact with more familiar facts about the external world. But the models that immediately disallow reasonable belief in metaphysics are too simplistic, and as

> a result are in trouble anyway. Our causal contact with the facts of logic, mathematics, and particle physics, for example, is quite unlike our causal contact with the facts of the everyday external world. The ray of hope for the metaphysician is this: when the models become more sophisticated, allowing for reasonable belief in logic, mathematics, and particle physics, perhaps they will also allow for reasonable belief in metaphysics as well.[36]

Unfortunately, this type of good company move is problematic in the present context, since it is not mathematics or morality that is targeted by the epistemological arguments, but rather controversial philosophical accounts of mathematics and morality. It is both false and dialectically improper to claim that rejecting a *philosophical theory* of mathematics like mathematical platonism is tantamount to rejecting mathematics itself.[37] This point is straightforward, but it is often missed in the literature on epistemological arguments.[38]

With this option removed, and given Sider's heavyweight realism about structure, I think the challenge of this section is extremely pressing. In any case, for the reasons discussed in chapter 1, I don't think that Sider's current approach to the epistemology of structure stands a chance of explaining our structure reliability in a plausible, non-*ad hoc* fashion. A world whose book is written using conjunction and negation looks just like a world whose book is written using disjunction and negation, and so forth and so on. At best, it is an open question whether Sider and other metaphysicians can come up with a plausible and theoretically satisfying epistemology of structure. At present, I think the burden of proof is on Sider to present an account that avoids the problems I have been posing. If he cannot, then it seems best for us to reject the notion of structure entirely, for accepting an epistemologically intractable notion seems pointless. But what at first seems pointless might well be forced: Sider could still argue, transcendentally, for the acceptance of metaphysical structure even in the face of a successful epistemological argument.

[36] Sider (2011), page 12.

[37] I am not claiming that Sider is falling into this confusion in the quoted passage.

[38] For example it is missed by those, like Burgess & Rosen (1997) and White (2010), who assimilate epistemological arguments to skeptical arguments.

3 Rejecting Metaphysical Structure

I've argued that Sider's proposed epistemology for structure fails and that there is reason to think that no epistemology for structure is compatible with a scientific view of the world. The obvious thing to do at this point is to reject the notion of structure and the epistemological puzzles that it brings. Yet there are some imaginable situations where accepting inaccessible structure facts would be the least repugnant of the options available to us. We would be in such a situation if rejecting structure altogether was somehow incoherent. In his preface, Sider seems to suggest this:

> ...deflationary metametaphysical stances are thus themselves metaphysical stances. There is no ametaphysical Archimedean point from which to advance deflationary metametaphysics, since any such metametaphysics is committed to at least this much substantive metaphysics: reality *lacks* a certain sort of structure.[39]

Perhaps by this Sider only means that thinking reality lacks structure is, itself, a view of reality that can be called metaphysical in a broad sense? If so, then while I don't disagree, this line can't save Sider's notion of metaphysical structure. So whether or not it is exactly what Sider had in mind, let's consider a more ambitious reading of this quote according to which Sider is claiming that saying that reality lacks a certain kind of structure is, itself, a claim involving his notion of structure. We can imagine this line of thought adapted to the epistemological skepticism of this note in a straightforward way: since I'm advocating the rejection of structure based on the epistemological argument, Sider can accuse me of making the claim that *there is no metaphysical structure*, which itself states a kind of structure fact. According to this accusation, my argument is self-defeating: it purports to show that we couldn't be reliable about structure and so should reject structure facts, but the argument's conclusion is itself a claim about structure that I take to be *established* by the argument.

If this were an accurate reconstruction, there would be serious tension, but I don't think it's a fair account. Sider is introducing a new and controversial notion; surely we can *reject the notion* without thereby making claims involving the notion in question. Of course, there are notions that we cannot coherently reject (for instance, the notion of *rejection* itself) but it would be highly surprising if a conceptual latecomer like *structure* was one of these un-rejectable

[39] Sider (2011), page vii.

notions.

We can and should reject structure not by making a structure claim but by refusing to add the concept to our conceptual toolbox. This type of rejection, which we can call *conceptual rejection,* can be illustrated as follows: the term "honky" is a racial slur used to refer to caucasians (such as myself). Now imagine that you were to ask a non-racist whether or not I am a honky. What would they say? Being a non-racist, they surely wouldn't endorse the use of a racial slur and so wouldn't say "yes". But, being a non-racist, they likely wouldn't say "no" either, since doing so seems to indicate acceptance of the notion together with a judgment that its application conditions are not met in this particular case. The non-racist would most likely refuse to answer the imagined question because they reject the very concept embodied in the slur.

Conceptual rejection is sometimes expressed by explicitly rejecting a term. An example of this occurred during one of Oscar Wilde's trials. On April 3rd 1895, defense attorney Edward Carson asked Wilde about John Francis Bloxam's story "The Priest and the Acolyte",

> Carson: Do you think the story blasphemous?
>
> Wilde: I think it violated every artistic canon of beauty.
>
> Carson: I wish to know whether you thought the story blasphemous?
>
> Wilde: The story filled me with disgust. The end was wrong.
>
> Carson: Answer the question, sir. Did you or did you not consider the story blasphemous?
>
> Wilde: I thought it disgusting.
>
> Carson: I am satisfied with that. You know that when the priest in the story administers poison to the boy, he uses the words of the sacrament of the Church of England?
>
> Wilde: That I entirely forgot.
>
> Carson: Do you consider that blasphemous?
>
> Wilde: I think it is horrible. "Blasphemous" is not a word of mine.[40]

By rejecting the word "blasphemous", Wilde clearly wasn't indicating preference for another word with the same meaning. Instead, by rejecting the word, Wilde

[40]The transcript from which this excerpt is taken can be found online at http://law2.umkc.edu/faculty/projects/ftrials/wilde/Wildelibeltranowcross.html.

was rejecting the very concept of blasphemy. His attitude toward the notion of blasphemy was that of conceptual rejection.

We also, sometimes, express conceptual rejection in ways that sound indistinguishable from standard rejection claims, but if pressed the difference can easily be made manifest. In our racist case above we can distinguish between someone who rejects the concept expressed by the slur and someone who accepts it but thinks, mistakenly in this case, that the application conditions aren't met. Sider's transcendental argument fails because the metaphysical skeptic can conceptually reject structure without any incoherence even if the skeptic sometimes expresses this rejection in ways that seem to *use* the notion of structure, e.g., by saying "there is no metaphysical structure". The concept of structure is not somehow magically non-rejectable.

So rejecting the notion of structure is coherent, but maybe there are still decisive reasons against rejecting the notion? Sider sometimes writes as if the rejection of structure, even if coherent, would lead to radical universal constructivism.[41] The opponent of structure would, according to this line of thought, fall into some structuralist or post-structuralist or post-modernist or deconstructionist nightmare according to which the world of electrons and buildings and stars is constructed by human discourse. If the choice were between Sider's metaphysical realism and this kind of global constructivist nonsense, I would gladly stand with Sider. Happily though, other options are available.

Global constructivism claims that, in some sense, we or our practices *make* reality. The global constructivist holds that stars and skyscrapers and ouija boards are mind dependent. But there are other ways to deny general mind dependence without accepting Siderean structure, e.g., by working with a modal or explanatory notion of *dependence*; I see no reason to think that structure deniers are barred from being able to accept and claim that governments and political boundaries exist only because of our practices but electrons and planets exist independently and in no way owe their ontological status to our activities.

It is both coherent to reject metaphysical structure and no catastrophe would result were we to do so. Still, this falls short of establishing that we *should* reject the notion of structure. I won't argue in detail for the rejection of structure here; instead I'll limit myself to briefly sketching two considerations in favor of rejecting structure. The first appeals to the epistemological worries discussed above and was mentioned at the outset of this section. If I'm right and a rea-

[41] See, e.g., the discussion on the bottom of page 18 of Sider (2011).

sonable epistemology for metaphysical structure can't be given together with a naturalist picture of cognition, then metaphysical structure would be a completely idle theoretical posit and it would be best for naturalists to reject such a pointless and puzzle-generating notion.

The second is that structure is extremely mysterious. Sider's notion of structure leads to a version of realism far more extreme than any standard version of scientific realism. The scientific realist thinks that the world of material objects exists independently of human conventions and practices. The Sider-style metaphysical realist adds to scientific realism the claim that this independently existing world has some privileged description even though there is no scientific advantage to accepting this sacred description over distinct but mathematically equivalent descriptions. And, indeed, scientists would regard the competing theories offered by metaphysicians as mere uninteresting notational variants. It is extremely difficult to understand what it could mean for one out of many mathematically equivalent descriptions of reality to be metaphysically privileged. Sider appeals to the metaphor of the book of the world in order to make sense of this idea, but most of us, reasonably, reject the real and literal existence of a book of the world (including Sider). But if God or gods aren't really, in some sense, designing the world using a particular conceptual vocabulary, then it is unclear what metaphysicians like Sider are interested in. There is no book of the world, and since there is no book of the world, no sense can be made of writing the book of the world or discovering the language in which the book of the world is written. This mysteriousness is reason to reject the notion of structure.

Though I won't argue for this here, I think a similar cloud of mystery surrounds other hyperintensional heavyweight metaphysical notions, including Lewis's notion of objective naturalness. The features of Sider's notion of structure that generate epistemological problems (mind independence, objectivity, acausality, etc.) are those common to naturalness, grounding, metaphysical definition, and other recent additions to the metaphysical toolkit.

In summary: we can coherently reject Siderean structure and still think that there is a way the world is, in itself. And we need not throw out the (metaphorical) book of the world when we reject metaphysical structure, rather, we can admit that that the book of the world can be written in more than one way. But admitting that there are several ways of writing the book of the world is not to admit that *every* way of writing the book of the world is just as correct as any other, nor is it to admit that it is the book that makes the

world. I think that, pace Sider, we can and should be *realists* without being *metaphysical realists*.[42,43]

References

[1] Armstrong, D. M. (1978) *Universals and Scientific Realism*. Cambridge: Cambridge University Press.

[2] Balaguer, Mark. (1995). "A Platonist Epistemology." *Synthese* 103: 303-325.

[3] Benacerraf, Paul. (1973). "Mathematical Truth." *Journal of Philosophy* 70: 661-680.

[4] Burgess, John P. & Rosen, Gideon. (1997). *A Subject With No Object: Strategies for a Nominalistic Interpretation of Mathematics.* Oxford: Oxford University Press.

[5] Carnap, Rudolf. (1950). "Empiricism, Semantics, and Ontology", *Revue Internaitonale de Philosophie* 4: 20-40.

[6] Clarke-Doane, Justin. (forthcoming). "What is the Benacerraf Problem?"

[7] Donaldson, Thomas. (2014). "Reading the Book of the World." *Philosophical Studies* 172: 1051-1077.

[8] Dorr, Cian. (2013). "Reading *Writing the Book of the World." Philosophy and Phenomenological Research* LXXXVII(3).

[9] Enoch, David. (2010). "The Epistemological Challenge to Metanormative Realism: How Best to Understand It, and How to Cope with It" *Philosophical Studies* 148 (3):413–438.

[10] Field, Hartry. (1989). *Realism, Mathematics, and Modality*. Oxford: Blackwell.

[42] See Putnam (1978) for a somewhat similar distinction between "scientific realism" and "metaphysical realism".

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[11] Gamow, George. (1966). *Thirty Years that Shook Physics: The Story of Quantum Theory*. New York: Doubleday.

[12] Hirsch, Eli. (1993). *Dividing Reality*. Oxford: Oxford University Press.

[13] Hirsch, Eli. (2011). *Quantifier Variance and Realism: Essays in Metaontology*. Oxford University Press: New York.

[14] Hirsch, Eli. (2013). "Comments on Theodore Sider's *Writing the Book of the World*". *Philosophy and Phenomenological Research* LXXXVII(3).

[15] Lewis, David. (1970). "How to Define Theoretical Terms." *Journal of Philosophy* 67: 427–46.

[16] Lewis, David. (1983). "New Work for a Theory of Universals." *The Australasian Journal of Philosophy* 61: 343-377.

[17] Lewis, David. (1984). "Putnam's Paradox." *The Australasian Journal of Philosophy* 62: 221-236.

[18] Lewis, David. (1986). *On the Plurality of Worlds*. Oxford: Blackwell Publishing Ltd.

[19] Linnebo, Øystein. (2006). "Epistemological Challenges to Mathematical Platonism." *Philosophical Studies* 129: 545-574.

[20] Madrid Casado, Carlos. (2008). "A Brief History of the Mathematical Equivalence between the Two Quantum Mechanics." *Latin American Journal of Physical Education* 2:2.

[21] Nozick, Robert. (1981). *Philosophical Explanations.* Cambridge: Harvard University Press.

[22] Peirce, Charles Sanders. (1878). "How to Make Our Ideas Clear" *Popular Science Monthly*. January edition: 286-302.

[23] Price, Huw. (2009). "Metaphysics after Carnap: The Ghost Who Walks?" in Chalmers, Manley, Wasserman (eds.). *Metametaphysics: New Essays on the Foundations of Ontology.* Oxford: Oxford University Press.

[24] Putnam, Hilary. (1978). "Realism and Reason." in his *Meaning and the Moral Sciences*.

[25] Putnam, Hilary. (2004). *Ethics Without Ontology.* Harvard University Press: Cambridge.

[26] Quine, W.V.O. (1948). "On What There Is." *Revue of Metaphysics* 2:21-38.

[27] Quine, W.V.O. (1951a). "Two Dogmas of Empiricism." *Philosophical Review* 60: 20-43.

[28] Quine, W.V.O. (1951b). "On Carnap's Views on Ontology." *Philosophical Studies* 2: 65-72.

[29] Quine, W.V.O. (1960). "Carnap and Logical Truth." *Synthese* 12: 350-374.

[30] Ripley, David. (2011). "Negation, Denial, and Rejection." *Philosophy Compass* 6(9): 622-629.

[31] Schechter, Joshua. (2010). "The Reliability Challenge and the Epistemology of Logic." *Philosophical Perspectives*: 24: 437-464.

[32] Sider, Theodore. (2001). *Four-Dimensionalism: An Ontology of Persistence and Time.* Oxford University Press.

[33] Sider, Theodore. (2011). *Writing the Book of the World.* Oxford University Press.

[34] Sider, Theodore. (2013). "Replies to Dorr, Fine, and Hirsch" *Philosophy and Phenomenological Research* LXXXVII(3): 733-754.

[35] Soames, Scott. (2009). "Ontology, Analyticity, and Meaning: the Quine-Carnap Dispute." in Chalmers, Manley, Wasserman (eds.). *Metametaphysics: New Essays on the Foundations of Ontology.* Oxford: Oxford University Press.

[36] Sosa, Ernest. (1999). "How Must Knowledge be Modally Related to What is Known?" *Philosophical Topics* 26(1 & 2): 373-384.

[37] van der Waerden, B.L. (1973). "From Matrix Mechanics to Wave Mechanics to Unified Quantum Mechanics." in *The Physicist's Conception of Nature* (J. Mehra, ed.) D. Reidel Publishing Company: Dordreicht.

[38] Von Neumann, J. (1932). *Mathematical foundations of quantum mechanics.* Princeton: Princeton University Press.

[39] Warren, Jared. (2014). "Quantifier Variance and the Collapse Argument." *The Philosophical Quarterly.*

[40] Weinberg, Steven. (1994). *Dreams of a Final Theory: The Scientist's Search for the Ultimate Laws of Nature.* Vintage Books: New York.

[41] White, Roger. (2010). "You just believe that because..." *Philosophical Perspectives* 24 (1):573-615.

[42] Williams, Bernard. (1978). *Descartes: The Project of Pure Inquiry.* Middlesex: Penguin Books.