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A survey of logical realism

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Abstract
Logical realism is a view about the metaphysical status of logic. Common to most if not all the views captured by the label 'logical realism' is that logical facts are mind- and language-independent. But that does not tell us anything about the nature of logical facts or about our epistemic access to them. The goal of this paper is to outline and systematize the different ways that logical realism could be entertained and to examine some of the challenges that these views face. It will be suggested that logical realism is best understood as a metaphysical view about the logical structure of the world, but this raises an important question: does logical realism collapse into standard metaphysical realism? It will be argued that this result can be accommodated, even if it cannot be altogether avoided.

Keywords Metaphysics of logic · Logical realism · Metaphysical realism · Logical constants · Negation · Grounding

1 Introduction

What is *logical realism*? One obvious reading suggests that the notion stands for realism *about* logic. We can then ask what is meant by 'realism' and whether 'logic' refers to a unified discipline, which will give us various senses of logical realism. But my purpose in this paper is slightly different. It shall be suggested that logical realism is best understood as a metaphysical view about the logical structure of the world. However, this raises an important question: does logical realism collapse into standard metaphysical realism? It turns out that this result cannot be avoided entirely, but it can nevertheless be accommodated in such a way that it still makes sense to talk about logical realism as an independent view.

I will assume a common albeit somewhat underdetermined conception of 'realism' as mind- and language-independence. I will also assume that 'logic' is indeed

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a unified discipline in the sense that it has a particular goal. This latter assumption is certainly controversial, since it is plausible that logic can be pursued in a variety of ways and not all of these are necessarily goal-oriented. This question about the unity of logic reflects a lively debate within philosophical logic concerning *monism* and *pluralism* about logic. This debate is sometimes conducted under the theme of 'one true logic' (cf. Resnik 1996; Russell 2008), whereby the monists would think that there is indeed one logic that is true in the relevant sense. What is this relevant sense? Here we arrive at a question intertwined with logical realism, since one possible reading is that the one true logic must somehow reflect mind- and language-independent reality. For the record, the sense in which I will assume unity about logic as a discipline does not commit one either to monism or pluralism about logic, although this issue will not be examined in detail.

Fortunately, the pursuit of an understanding of logical realism does not have to start from scratch. There have recently been a few attempts to define the view. One such attempt comes from Sandra LaPointe (2014). LaPointe, drawing on Michael Resnik (1999), suggests that logical realism in its various forms is committed to the following two theses[1]:

> (LF) There are *logical facts* (or 'logical structure'), that is, there is a fact of the matter when it comes to the truth-value of claims about logic.
>
> (IND) Logical facts are independent of our cognitive and linguistic make-up and practices. They are *objective* in the sense that they are mind- and language-independent.

Like LaPointe, I also want to set aside the analysis of *truth* or, more precisely, what it is for a logical fact to make some claim about logic true (but see Tahko (2014) for related discussion regarding logical truth). The primary reason for this, besides the difficulty of the question, is that for present purposes it's the second of the two definitive theses, namely (IND), that is more interesting. As LaPointe correctly observes, (LF) and (IND) are compatible with various views.[2] In particular, LaPointe notes that Stewart Shapiro's (2014) 'folk-relativism' about logic is also compatible with logical realism, as it satisfies (LF) and (IND).

In Shapiro's view, there can be relativity about logic analogously to relativity about, e.g., simultaneity or length. In other words, before we can assess claims about simultaneity or length, we need a frame of reference. The same goes for logic: to get a truth value, we need a frame of reference.[3] Shapiro himself takes J.C. Beall

[1] See also Penny Rush's (2014) discussion of a version of (IND), whereby 'were there no humans to experience or be conscious of it, logic would still be as it is' (Rush 2014: p. 15). One of the most recent accounts is by Michaela McSweeney (2019); we will return to it below.

[2] Something like Gila Sher's (2011) dual view, according to which logic 'is grounded both in the mind and in the world' (p. 354) would seem to be already ruled out by (IND), but we will return to her latest views (Sher 2016) on the matter in the next section and see that Sher's view as well may be considered a form of logical realism.

[3] We might compare this with Resnik (1999: p. 185), who suggests that (IND) is also compatible with 'apparent objectivity'. In other words, Resnik thinks that linguistic conventions, centrality to science, and even logic as a function of our psychology can give a sense of objectivity. It's quite clear though that this

and Greg Restall (e.g., 2006) to be folk-relativists about logical validity in precisely this sense: before we can fix on a truth value, we must know which notion of logical validity we are using. Now, Beall and Restall are of course generally known to defend a type of logical pluralism about validity. So, the issue here is that logical realism as defined above turns out to be compatible with logical pluralism as well as logical monism. LaPointe only discusses monistic versions of logical realism, but we would do well to consider how the monistic and pluralistic versions might differ. On the Beall–Restall line, it can still be objective that, in a given *case* (frame of reference), true premises entail a true conclusion. Logical pluralism of this type can certainly satisfy (IND), if it is appropriately understood.

Since the literature on logical pluralism is now massive and would require a paper of its own to do justice to, I will not attempt to survey it here. Instead, I will simply give an example of a possible way to understand the distinction which is particularly interesting from the point of view of logical realism. This understanding comes from a recent survey by Eklund (2017), where he discusses 'goodness pluralism': given some particular purpose, different languages serve that purpose equally well. The problem is finding what the privileged 'purpose' is supposed to be. For a logical realist, this privileged purpose ought to contain a relevant realist component. Eklund associates this type of view with Sider's (2011) work (although Eklund himself dismisses it rather quickly). According to Eklund's reading of Sider, among the possible meanings of logical constants there are some that are 'especially fundamental, or natural, or structural, or joint-carving' (Eklund 2017: p. [16]). The one true logic would then attempt to capture those logical expressions that have this privileged status. From Eklund's point of view, this way of understanding the debate is not particularly interesting, as it drives us from philosophical logic towards metaphysics. But since we are here interested in logical realism, this connection to metaphysics is to be expected.

Setting aside these initial complications, we should get clearer about what motivates logical realism in the first place. This is the goal of sections two and three, where we will outline some views in the literature that the label 'logical realism' may be associated with, focusing on Sher's and Maddy's projects. In section four, two versions of logical realism will be analysed. The fifth section concerns a case study of the status of negation in logical realism. Finally, in section six, the important question of the status of logical realism compared to standard metaphysical realism will be discussed.

Footnote 3 (continued)
would not constitute mind- and language-independence in the sense that is traditionally associated with realism, so I will set this complication aside.

2 Motivation: a foundation for logic

Why should we be interested in logical realism? One clear reason is that it would provide an interesting route toward a *foundation* or *grounding* for logic. This is something that has been of interest to a number of historical authors—we can see this type of project at least in Bolzano, Frege, Russell, Tarski, Wittgenstein, and even Quine, to name just a few.[4] In contemporary philosophy of logic, systematic book-length efforts have been put forward only by a handful of authors, including Chateaubriand (2001, 2005), Hanna (2006), Maddy (2007) and Sher (2016).[5] Of course, foundations of logic have been discussed at least in passing my many more authors, but what sets these recent accounts apart is that they attempt to give logic more than just a pragmatic foundation—a foundation based on the uses of logic. Sher expresses this is terms of the *veridicality* of logic. Indeed, she notes the reason why there are relatively few attempts to pursue more than a pragmatic foundation:

> Most contemporary philosophers seem to believe that a substantive, theoretical foundation for logic, and especially one focused on its veridicality, is impossible. (Sher 2016: p. 241.)

If there is one key tenet of logical realism, it must surely be that it *is* possible to provide a foundation for logic. It might be helpful to look at this idea from the point of view of a well-known debate in philosophical logic, namely the debate about dialetheism, the view that there are true contradictions.

The dialetheist view can be understood in two different ways, aptly summarized by Mares (2004):

> The metaphysical dialetheist holds that there are aspects of the world (or of some possible world) for which any accurate description will contain a true contradiction. Semantic dialetheism, on the other hand, maintains that it is always possible to redescribe this aspect of the world, using different vocabulary (or perhaps vocabularies), consistently without sacrificing accuracy. (Mares 2004: p. 270.)

Semantic dialetheism is probably quite widely accepted. It seems fairly plausible that our language is often vague and even contradictory, but the semantic dialetheist thinks that the vagueness in question is merely linguistic (or epistemic) and does not necessarily reflect any true contradictions in the world. In other words, semantic dialetheism is something that we can accept on the basis of a pragmatic foundation for logic, because it is not surprising that our language should turn out to be inconsistent at times. But metaphysical dialetheism is a much stronger and more

[4] These historical projects were of course very varied and not all of them could be properly labelled as 'logical realism', even if they have related features. I will not pursue the historical line in any detail here but see Lapointe (2014) for a discussion of Bolzano's views, Maddy (2007) on Frege and Kant, and Sher (2016) on several of these historical authors. In the third section we will return to some of these views.

[5] Thanks to an anonymous referee for the journal for drawing my attention to Hanna's and Sher's latest work.

controversial position. The best-known proponent of dialetheism, Graham Priest, is probably committed to metaphysical dialetheism (e.g., Mares 2004: p. 265). Priest does not directly engage with this issue, but he suggests that metaphysical dialetheism is a consequence of dialetheism plus metaphysical realism (2006: p. 302). The additional premise behind this is that the logical facts reflect the mind- and language-independent reality that metaphysical realism postulates, and this is precisely what the (IND) criterion for logical realism outlined earlier tries to capture.

Let's return to Sher's project. As she has previously suggested (Sher 2011), her account takes logic to be grounded both in the mind and the world, where these grounds are 'interconnected' (2016: p. 259); more precisely, Sher argues that logic is both 'constrained' and 'enabled' (*ibid*., 267) by the world. Here we are primarily interested in the worldly grounding of logic and the key in Sher's proposal is the *formal structure* of "real" objects:

> As a theory of the formal structure of "real" objects (configurations of objects), logic is anchored in reality; as a theory of the formal structure of our thought of objects, logic is anchored in the mind. (Sher 2016: p. 272.)

What is this formal structure, exactly? For instance, how do the logical constants relate to the structure of reality? Sher mentions formal properties such as self-identity, being reflexive, symmetric, and non-transitive, and also formal operations such as complementation and union. But in what sense do these formal properties and formal operations correspond to or govern reality? Sher (*ibid*., 276) has this to say: 'Formal operators distinguish patterns delineated by individuals and their properties, but not the individuals themselves.' This sounds plausible as far as it goes, but as of yet it's not quite clear whether there is any difference between the *formal* structure of the world and its plain 'structure'. So, the question that remains is whether there is some privileged role or subject matter for logic. It seems that such a role would be required to avoid logical realism collapsing into standard metaphysical realism. But we need some further tools before this problem can be addressed. We will return to this issue below, in the fourth section.

3 Further motivation: Maddy's naturalism about logic

Another influential project in philosophical logic that might shed some light into the correct understanding of logical realism is Maddy's (2007) naturalism about logic. Maddy draws inspiration from a variety of historical sources but let me mention just one: Frege. Maddy (2007: p. 201) traces the normativity of logic to Frege's idea that logic is concerned with the 'laws of truth' rather than mere 'laws of thought'. That is, the laws of logic are simply the most general laws, separated from the laws of physics only by a matter of degree. The laws of logic are thus laws of thought only in the sense that we should think in accordance with them 'if one is to think at all' (Frege 1893: p. 15). As Maddy notes, Frege's version of logical realism—and I think that we are entitled to call it that—is not widely accepted. This may be at least partly because of Frege's well-known commitment to logical facts as belonging to a Platonic 'third realm' of abstracta. Logical realism, as I understand it, can be

combined with several views about the nature of logical facts—and it should be considered neutral regarding Platonism and nominalism—so Frege's view might very well qualify. So, we do not have to abandon the possibility of a Platonist approach, but it would certainly introduce some problems. As pointed out by Sher (2016: p. 249), one of these problems is 'the application problem', namely, the problem of how a foundation of logic in the Platonic realm can be applied reliably in the empirical world. Nevertheless, Sher's own account is neutral with regard to Platonism and nominalism (ibid., 259), and I think that logical realism in general should indeed be understood as neutral in this regard, even if a Platonic version will face special problems. In any case, I do not wish to engage in Frege scholarship here. I mention the connection to Frege mainly as a precursor to Maddy's own view, since she does so herself.

So, what, exactly, is Maddy's position? Her approach certainly seems to respect the two constraints for logical realism that we started with: (LF) and (IND), for she aims to outline a view according to which 'logic describes the underlying structure of the world' (e.g., Maddy 2007: p. 225). More precisely, the 'first approximation' of her view is as follows:

> (1) logic is true of the world because of its underlying structural features, and (2) human beings believe logical truths because their most primitive cognitive mechanisms allow them to detect and represent the aforementioned features of the world. […] (3) human [beings] are so configured cognitively because they live in a world that is so structured physically. (Maddy 2007: p. 226.)

Strikingly, the view that Maddy outlines in the quoted passage and develops in her book, *Second Philosophy*, goes beyond a simple statement of logical realism in that she gives an empirically-motivated account of how human beings can epistemically access the objective logical structure of the world. This epistemic element is, I think, something that we should not build into the definition of logical realism itself, but any proponent of logical realism should of course ultimately address the epistemic challenge as well. Maddy's attempt to do so is perhaps the most developed so far. However, a major challenge for the epistemic reconstruction is that only very few rather trivial logical facts, such as perhaps those concerning identity, are such that they are easy to 'detect' even with our 'most primitive cognitive mechanisms', as Maddy puts it.

A key task for Maddy, which any proponent of logical realism should give some thought to, is to identify the relevant logical facts/structure of the world. Maddy herself draws inspiration from both Frege and Kant, specifically, the Kantian categories. She (2007: p. 227) focuses on the 'pure categories' of *object-with-properties* and *ground-consequent*; the first of these, when amended with the help of Frege's work, is better described as *objects-in-relations*. What emerges is Maddy's notion of a 'KF-world' (for Kant–Frege), an idealized starting point for our pursuit of worldly logical structure. The details do not concern us here, as the process of identifying such basic categories of worldly logical structure and the task of demonstrating that the idealization corresponds with the actual world are of course largely empirical (and Maddy engages with this project in detail, see especially Maddy 2007: Ch. III.4 and III.5). What is more important in the context of the present paper is the

underlying idea that drives Maddy's entire project. This idea is a deep commitment to logical realism.

As we can see, one upshot of Maddy's commitment to logical realism is that logic will involve an important empirical element—this reflects Maddy's overall naturalistic project. The key elements of Maddy's project are as follows: (1) identifying the rudimentary logic of the KF-world; (2) showing that our cognitive mechanisms allow us to detect and represent the KF-structure; and (3) demonstrate a causal connection between these cognitive mechanisms and the KF-structure (these points are adapted from Maddy 2007: p. 233). Moreover, for the project to be truly interesting, one would hope that we could move from the rudimentary logic to (something like) classical logic.[6] More challenges emerge if we get this far; these include the existence of vague predicates, which Maddy attempts to address by ruling out referentless names and by idealizing vagueness away, hence eliminating truth value gaps (Maddy 2007: pp. 286–287). Accordingly, the epistemic tasks that logical realism faces are challenging.

This concludes our motivational excursion. We are now in a position to start carving out the metaphysical implications of logical realism.

4 Logical constants and logical structure

We have now seen a few brief examples that motivate the study of logical realism, such as the general motivation to search for a foundation or grounding of logic, as specified by Sher, and Maddy's attempt to find a naturalistic foundation for logic. There is an important underlying distinction that we should draw here, but which these projects do not quite make explicit. Fortunately, McSweeney (2019) has recently formulated this distinction, which amounts to two ways of understanding logical realism. McSweeney asks: if logical realism is true, which of our logical concepts and terms respect the logical structure? This question may be ambiguous unless we clarify what 'respect' means here: does respecting the structure mean correspondence, isomorphism, being genuinely part of the structure, or something else? Although McSweeney herself does not draw this connection, I believe that both Sher's and Maddy's projects can be seen as attempts to address this question: in both cases a key part of the project is to find some connection between our use of logic in the cognitive sense (logic's groundedness in the mind) and the (formal) structure of the world. McSweeney discusses this issue in the context of Sider's project, which we already mentioned in passing in the introduction. She formulates the issue in terms of a dilemma with Sider's project in mind, where the status of the existential quantifier is of particular importance (McSweeney uses a different example

[6] See Hanna (2006) for a related project—he discusses 'protologic', which represents a special type of innate, cognitive *logic faculty* of our minds. Pursuing the details of the cognitive processes associated with this type of faculty would certainly be relevant for a thoroughgoing account of logical realism, but Hanna's own project seems to be primarily centred on human psychology, so it can't be considered a version of logical realism as we have defined it.

though). For Sider, it is important that the first-order existential quantifier 'carves at the joints' (Sider 2011: Ch. 9).

Now, as is well-known, the existential quantifier, ∃, may be expressed in terms of the universal quantifier, ∀, that is, the quantifiers are interdefinable as follows (for an arbitrary predicate 'F'):

$$\exists x\, \mathrm{F}x = \neg \forall x\, \neg \mathrm{F}x$$

$$\forall x\, \mathrm{F}x = \neg \exists x\, \neg \mathrm{F}x$$

So, in principle we can choose to use just one of these quantifiers in any given case. Given the interdefinability of the quantifiers, it seems that it could just as well be the universal quantifier that carves at the joints. This brings us to McSweeney's dilemma: either one of these quantifiers is *privileged* and truly respects the logical structure, or neither is and hence the true logical structure is *unfamiliar*.

One might think that there is a third option as well: both quantifiers carve at the joints. If there can be redundancy at the fundamental level (of logical structure), then this option is indeed open. The issue has not been pursued in very much detail, but some of the discussion on the notion of a *minimal supervenience base* is closely related (e.g., Sider 1996: p. 21, Eddon 2013). Sider (2011: pp. 259–260) discusses a similar condition which he labels 'nonredundancy'. Relevant examples include relations and their converses, such as 'earlier' and 'later', as well as the fact that several subsets of the logical operators are functionally complete (e.g., conjunction and negation, or the Sheffer stroke). One thing we must weigh in these cases is the potential theoretical cost of insisting on nonredundancy. Sider himself seems to think that redundancy may be acceptable in some cases and he explicitly rejects the nonredundancy constraint as being 'constitutive' of joint-carving, even if we shouldn't, in general, 'multiply ideology beyond necessity' (Sider 2011: p. 206). Indeed, the nonredundancy constraint does seem to fit well with popular theoretical virtues and it has been argued that this type of parsimony constraint should apply at least at the fundamental level (Schaffer 2015; see also Tahko 2018). The issue remains controversial and we do not need to settle it here. But it's clear from McSweeney's dilemma that unless we have some way to settle which of the quantifiers is privileged—or good reasons to accept that they can both carve at the joints—then one might be pushed towards the *unfamiliarity* horn and simply remain agnostic about the correct logical structure.

However, I suspect that this result might seriously undermine the motivation for logical realism: why should we think that logical realism is an interesting position, or even true, if we have no way of latching on to the correct logical structure? This question highlights the importance of Maddy's attempt to find a causal link between rudimentary logic and logical structure. So, even though we should keep logical realism as a metaphysical position separate from these epistemic questions, it seems clear that without some prospects of getting the epistemic project started, logical realism is not properly motivated as a metaphysical position.

Even if these obstacles can be overcome, we still have some work to do before logical realism can be clearly defined. McSweeney (2019: p. 120) has made an important start here. She defines two versions of logical realism, which she labels

ontological realism and *ideological realism*.[7] According to *ontological realism*, logical constants refer to individual entities. This is obviously a very fine-grained theory. If we accept nonredundancy, it follows that only one of '∃' or '∀' can carve at the joints. But which one? This is where the epistemic issue returns. The second alternative, *ideological realism*, takes logical constants to be syncategorematic. So, logical constants do not refer, but they are (more or less) joint-carving parts of ideology. This latter view would at least initially seem to be a better match with Sider's position and indeed the more plausible one, as the epistemic question is far more pressing on the first view. When it comes to ideology, there are, perhaps, more criteria to appeal to when deciding which parts of ideology are genuinely joint carving – one might for instance appeal to indispensability arguments (as Sider himself does in sec. 2.3 of his 2011 book).

Let me take a moment to clarify what is at stake here.[8] When we ask: 'Does '∃' or '∀' carve at the joints?', we are asking a question about the connection between these logical constants and something in the world—this is the starting point of logical realism. One way to understand this question is that we are asking what it is, *in reality*, that logic is grounded in. In other words, is the subject matter of logic ultimately about distinctly logical entities, presumably captured by the logical constants or is logic rather just a highly abstracted way of capturing the states of affairs that obtain between more familiar entities? This is what we are interested in when we compare the two versions of logical realism at hand. This issue should remind us of Sher's position, which, we may recall, is that formal operators distinguish patterns in reality, but not individuals.

Does the choice between these two versions of logical realism matter? Let us consider an example concerning conjunction. It may be helpful to frame this discussion in terms of the metaphysical grounding literature, since in this literature there is some related discussion about the difference between a plural ground and a conjunctive ground (e.g., Correia 2013). Without going into any details regarding grounding itself, we can see that there is an interesting analogy between the issue we are now discussing and the issue in the grounding literature. Consider an arbitrary atomic fact, f. Is there any difference between the following two cases?

The fact f is grounded in facts g, h

The fact f is grounded in the fact g & h

To analyse this case, we should first note that it is widely accepted by grounding theorists that true conjunctions are grounded in their conjuncts, so g & h is grounded in g, h. This is an intuitive result that we surely wish to preserve. Moreover, it is widely accepted that grounding is irreflexive; for instance, g & h can't ground itself.[9] But now the choice concerning different interpretations of logical realism suddenly

[7] Given that these labels are used more generally in metaphysics, I am not convinced that they are the best terminological choice in this context. Below, I will propose alternative labels.

[8] I'd like to thank an anonymous referee for the journal for pushing me to be clearer about this issue.

[9] There are dissenters though, see, e.g., Jenkins (2011).

becomes relevant. For we may ask: is there any *ontological* difference between g & h and g, h? On a 'worldly' conception of facts, it's not obvious that there is. This type of view is not uncommon among grounding theorists, here's Audi's take on the view:

> [A] fact is something's or some things' having properties or standing in relations […] Facts are particulars, and are individuated by their worldly constituents (objects, properties, relations) and the manner of their combination. (Audi 2012: p. 686.)

If we follow this line of thinking, it would appear that when g & h is properly interpreted—that is, when we focus on its worldly constituents—we end up just with g, h. The worldly constituents of the conjunctive fact g & h do not obviously involve conjunction. Or do they? This is precisely the choice point between the two interpretations of logical realism. Perhaps surprisingly, this choice may have important implications for questions concerning plural versus conjunctive grounds (albeit only if combined with a view that takes grounding itself to be a worldly relation, like Audi would seem to do). If the conjunction in g & h is not a constituent of the fact, then there is no apparent ontological difference between the conjunctive fact and the plural fact g, h—they express the very *same* fact. Hence, the irreflexivity of grounding may be threatened, at least if we require that grounding is a worldly relation. So, proponents of logical realism ought to be sensitive to such broader implications of their views as well. Similarly, certain views about grounding may only be compatible with a more fine-grained version of logical realism.

For what it's worth, I am inclined to think that the worldly conception of facts is correct and there really is no ontological difference between the plural fact and the conjunctive fact. The reasons for this will become clearer in what follows, but it is already good to note that this will eventually (in the sixth section) lead us to the main issue for logical realism, namely, the question of whether it collapses to metaphysical realism. This is because without a 'worldly presence' of the logical constants there doesn't seem to be any distinctly 'logical' content to logical realism.

We are now in a better position to understand the two discussed interpretations of logical realism. My recommended labels for them are *realism about logical constants* and *realism about logical structure*. Using the case of conjunction as an example, these views may be understood as follows:

> *Realism about logical constants*: f & g is properly interpreted only if the conjunction & (in addition to f, g) is part of mind- and language-independent reality—the logical constants have a 'worldly presence'.
> *Realism about logical structure*: f & g can be interpreted simply by noting that f and g are part of mind- and language-independent reality—the logical constants have no distinct 'worldly presence'.[10]

[10] It should be noted that the commitment to logical atomism implicit in this account is optional; it is possible to define a version of realism about logical structure which operates at the level of complex propositions. However, for ease of exposition, I will continue to operate with the version involving atomic facts.

These two interpretations of logical realism are remarkably similar with two different ways of interpreting the pursuit of a fundamental, joint-carving language. Sider's project is of course concerned exactly with the search for such a language, but the issue I have in mind has, in contrast, received relatively little attention. The most prominent exception is a book symposium on Sider's *Writing the Book of the World*, where Fine has made these two interpretations explicit. The two interpretations of logical realism above can be further illuminated via Fine's distinction between what he calls the *E-project* (for 'expression') and the *D-project* (for 'description'):

> The E-project is concerned with *saying* what can be said in the most fundamental terms, while the D-project is concerned with *describing* what can be described in the most fundamental terms. (Fine 2013: p. 730.)

The focus of the E-project is on sub-propositional constituents of propositions, whereas the D-project is concerned with propositions which we take to describe the world. Consider the disjunction f ˅ g. Presumably, it will always be interpreted as either f or g. So, from the point of view of the D-project, the disjunction might very well be dispensable (compare with the worldly facts view discussed above). This can be the case even if disjunction is indispensable in the E-project. As Fine himself puts it, 'The E-fundamentals are likely to include the logical constants, for how else is one to say something negative or disjunctive or existential?' (Fine 2013: p. 730). The core question is: are there any logical constants among the D-fundamentals? If there are, then realism about logical constants is the correct view, but if there are not, then realism about logical structure is the way to go. Fine's main complaint about Sider's project is that it's not at all clear which project he is involved with—Fine even claims that Sider sometimes seems to take it for granted that logical constants are D-fundamental without giving any reasons to think that they are necessary in the relevant sense, i.e., for describing (rather than just expressing) the mind- and language-independent world (Fine 2013: p. 731). If this is right, then it is difficult to say whether Sider's view should fall under realism about logical constants or under realism about logical structure.

It should be acknowledged that Sider has provided a reply to Fine's concerns. Sider (2013: p. 739) explicitly states that his approach to fundamentality is sub-propositional (whereas Fine's is propositional). This would appear to put Sider's project within the remit of the E-project, but he doesn't appear to be entirely happy with this result. Regarding Fine's distinction between the E-project and the D-project, Sider acknowledges that it is 'illuminating', but considers one of his core assumptions to be the rejection of this distinction, or at least 'denying that it has the significance Fine thinks it has' (Sider 2013: p. 742). Sider attempts to put pressure on Fine's idea by insisting that, say, if disjunction is indeed E-fundamental, then 'a complete description of the world' must also include the true disjunctions. But it appears to me that this is based on an equivocation of 'a complete description of the world'. As I understand the idea, only the D-project is concerned with 'a complete description of the world'. It may be that there are things that we cannot *express*, say, without the use of disjunction, but this does not make disjunction D-fundamental. A further argument is needed in order to include logical constants among the D-fundamentals. Sider does not put forward this type of an argument, since he attempts to question

the entire distinction between the E-project and the D-project. But we can now see that this distinction has broader applicability than just the debate between Fine and Sider: it can also help us understand different interpretations of logical realism.

I shall now put my own cards on the table regarding this issue. As mentioned earlier, I am sympathetic to the idea of worldly facts, and I find that it is the D-project that we should focus our efforts on. So, the central question that I am interested in is whether there are any logical constants among the D-fundamentals. I believe that on the face of it the more plausible answer, by far, is that there are not. In other words, I favour realism about logical structure over realism about logical constants. But as I have noted, there may be a price to pay for this position, namely, on this combination of views, it looks as if there is no way to differentiate plural and conjunctive facts at the level of the D-project. This in turn raises the now familiar challenge for the friends of worldly grounding, namely, the potential threat to the irreflexivity of grounding. There are two possible lines that seem available regarding this issue. The first is to maintain that grounding concerns the expressive level (that is, grounding itself is not a worldly relation), where we can (indeed, perhaps we must) differentiate between plural and conjunctive facts, be it as it may that there is no real ontological difference between them. The second option is to bite the bullet and abandon the irreflexivity of grounding. This may seem like a heavy price to pay for proponents of grounding, but it is not unheard of (see, e.g., Jenkins 2011; Bliss 2018). However, I will not take an official stand on this issue here, in part because there are still open questions regarding the logic of ground and I suspect that future results may have further implications on this issue.[11] There is one caveat though: the case of negation. Here I think that the realist about logical constants still has one card to play.

5 The case of negation

Consider negation. Applying the distinction between E- and D-fundamentals introduced in the previous section, it seems clear that negation is among the E-fundamentals, because we really cannot express very many things without it. But could it also be among the D-fundamentals? Here the friend of realism about logical constants might have an interesting case, since it is notoriously difficult to explicate what the ontological basis (truthmaker) of a negative proposition is. What kind of logical structure, that is, D-structure, could make a negative proposition true? Well, there is an old line of argument, starting from Demos (1917), which could be attempted. The idea is that negative facts can always be accounted for in positive terms. The fact that John is not home is made true by the fact that he is at the pub. Problem solved! Negation is not needed among the D-fundamentals because we can account for it in terms of "positive" structure. Unfortunately, as is well known, this solution as well as its close relatives such as accounting for negation in terms of absences run into some difficult problems [for discussion see, e.g., Beall (2000) and Molnar (2000)].

[11] One of these open issues concerns the logic of many-many or bicollective ground, as discussed by Litland (2016, 2018).

Indeed, the friend of realism about logical constants could insist that the burden of proof is on the realist about logical structure, since, as Molnar puts it: 'the Holy Grail of positive truthmakers for negative truths remains undiscovered' (Molnar 2000: p. 85). So, it might seem that the only remaining option is to postulate negation as a D-fundamental and adopt realism about logical constants after all.

But I think that there is a promising line of reply to this, which friends of realism about logical structure could still attempt. The idea starts by postulating *primitive incompatibility* as a genuine, worldly feature. This feature is supposed to be a "positive" part of the D-structure in the required sense, but it's of course not a logical constant itself. I think that already Aristotle could be seen as entertaining an idea not far removed from this in one of his several formulations of the law of non-contradiction:

> The same attribute cannot at the same time belong and not belong to the same subject in the same respect. (Aristotle, *Metaphysics* 1005b19–20.)

Of course, negation is used in Aristotle's formulation, but once we properly understand Fine's distinction between the E-project and the D-project, we can see that negation is, perhaps, merely an E-fundamental in this formulation. The real work is done by the incompatibility reflected in the idea of the same subject possessing and not possessing the same attribute at the same time. This is perhaps clearer if we change the case to two contrary properties; for instance, the same subject cannot have both a positive and a negative charge at the same time.

The underlying idea, of incompatibility as the worldly source of negation, does come up from time to time. Here's a quote (admittedly out of context) from Huw Price: 'I suggest that negation be explained in terms of the primitive notion of incompatibility' (1990: p. 228). Now, Price himself is in fact interested in the evolutionary basis of negation rather than Fine's D-project, so it's unlikely that he would want to suggest that primitive incompatibility is a D-fundamental. But notice that Price's evolutionary project is important for the friend of realism about logical structure as well, since it must also be explained how negation emerged as an E-fundamental from the logical structure. This would be part of the epistemic project that we saw Maddy to pursue. We can find a somewhat more explicit defence of the idea of primitive incompatibility in Berto's work. In a recent paper, Berto suggests that incompatibility 'carves nature at its joints' (Berto 2015: p. 11).[12] However, I will not defend this idea any further here (but see Tahko 2017). Obviously, more work is needed before realism about logical structure can be fully reconciled with the case of negation, but my concern here is simply to point towards one possible route. In any event, the case of negation may very well be one of the most important test cases in the debate between realism about logical constants and realism about logical structure.

[12] See also Berto (2008) for an attempt to formulate a (metaphysical) version of the law of non-contradiction, which even the dialetheist must accept. Berto's idea is that the law of non-contradiction may be understood as a principle regarding structured exclusion relations (between properties, states of affairs, etc.), and the world is determinate insofar as it conforms to this principle. This type of idea is also taken up in Tahko (2009).

6 The overgeneration problem

I will conclude with a brief discussion of the looming, underlying problem for realism about logical structure that we have already noted in passing several times.[13] If realism about logical structure is true, then we face the following question: What counts as logical structure, apart from just *structure*? This is the *overgeneration problem*. Presumably, we don't want all structure to count as logical, in the sense postulated by realism about logical structure. But if logical constants are not part of the structure of the world, then what makes realism about logical structure a version of *logical* realism rather than just plain old metaphysical realism? In other words, isn't realism about logical structure a type of reductionism about logic, whereby the subject matter of logic is reduced to the subject matter of metaphysics?

There is a sense in which this is correct, and therefore a sense in which the proponent of realism about logical structure could simply bite the bullet. But if we accept that (some of) the logical constants are E-fundamental—that we need them to express what the world's structure is like, whether or not we conceive of it as logical—then realism about logical structure is still an interesting view. So, the realist about logical structure could maintain that there is D-fundamental (logical) structure that we can capture with logical constants (e.g., primitive incompatibility is D-fundamental), but the constants do not refer to entities. While this type of view could indeed be seen as reductionism about the subject matter of logic, it doesn't really undermine the importance of logic in any way. After all, we must use the logical vocabulary (given that it is E-fundamental!) to talk about the part of world's structure that logic is interested in.

Accordingly, are we not entitled to stipulate that realism about logical structure concerns a particularly interesting part of world's structure, namely, the logical structure? This stipulation is based on the fact that we associate a particular importance with logic, but the situation might not be very different even if there were logical constants among the D-fundamentals. In that case, there would be a very straight-forward route from the E-fundamental logical vocabulary to a certain part of the world's structure which we can identify as *logical* structure. Yet, it would still be the case that this part of the world's structure is of particular interest to us because of the role of logic in our way of *expressing* certain things about the world. If that's right, then both forms of logical realism concern a certain proper part of reality's structure, which we have simply chosen to label as *logical* structure. I shall end on this reconciliatory note, even though my sympathies do remain with realism about logical structure and the idea that the one true logic is really just a particularly suitable expressive device for capturing the most basic features of the (logical) structure of the world.

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