To take this route would be to show how psychic reintegration might come back into focus as a real possibility on the, or a, Christian view of conscience, and how we might even keep a more or less complete recognition of the agent's responsibility for clear-eyed choices of the bad. In brief: the bad choices that me-then made really were *my* choices; for all that they can be choices that I do well to reject, because it is possible that me-then, though truly and genuinely *me*, was acting, perhaps not entirely realising it, out of the untamed Stone Age rather than out of well-thought-through civilised values. The key to the manoeuvre, and to the peacemaking that it offers to do between one version of the individual and another, is its recognition that we are not *naturally* integrated within, and not naturally (to use a word of Aristotle's) enkratic either. Integration is an *achievement*, and so is enkrateia (let alone temperance). We do not start off that way, and we have work to do to get there.[7]

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The Boundary Stones of Thought: An Essay in the Philosophy of Logic
By Ian Rumfitt
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What is logic? And what is the *correct* logic? In *The Boundary Stones of Thought,* Ian Rumfitt offers insightful and complex answers to these questions. In particular, Rumfitt's primary aim is to provide a vindication of classical logic, by releasing it from the ties of classical semantics. That is to say, classical logical rules such as the Law of the Excluded Middle (for all p, p or not-p) and Double Negation Elimination (if not-not-p, then p) are defended without appeal to the semantic Principle of Bivalence (every statement is true or false).

The book covers a lot of ground. Part I presents an account of the nature of logical consequence relations, logical laws, and logical necessity. Part II addresses attacks on classical logic. In the course

[7] Thanks for their comments to John Cottingham, Andrew Huddlestone, Adrian Moore, Edward Skidelsky, Robert Skidelsky, John Skorupski, and other contributors to a symposium on the history of moral concepts in Westminster, October 2015.

of the defence of classical logic, we are presented with several proposals. An exclusionary account of content – and an associated exclusionary semantics for a logic – is developed and defended. An alternative to possible worlds semantics, given in terms of possibilities that are not as determinate as whole worlds, is offered, in part as a solution to worries for classical logic arising from quantum mechanics. The disagreement between intuitionists and classicists over the semantics for negation is cleverly distilled into a question of whether or not the space of possibilities, in terms of which a semantics for propositional logic is given, satisfies a certain property, namely, that all statements 'have a back'. A semantics for vague predicates is given in terms of 'poles'. And Rumfitt also argues that we can defend the use of classical logic in set-theoretic reasoning without requiring a commitment to a platonic realism about sets. Ultimately, Rumfitt claims, we can defend classical *logic*, whilst agreeing that classical *semantics*, in particular the Principle of Bivalence, are doubtful: 'I hope the preceding work may have fortified, or even instilled, the conviction that classical logic can best thrive without bivalent semantics' (320).

Does Rumfitt succeed? In order to assess any contribution to a dispute over rival logics, we must first ask how such a dispute is even possible without the different sides either talking past each other or begging the question. The worry is that, in arguing in defence of a particular logic one will need to appeal to some logical principles. If one uses the principles at issue, one will fail to persuade a non-believer, and will be open to the charge of begging the question. If we simply take the disputants to mean something different by their logical words, there would appear to be no substantive dispute at all. Rumfitt's proposal is to develop non-homophonic semantic theories that are stable under contested changes of logical rules. Roughly put, a homophonic semantics, in more or less restating the target expression in the statement of its semantic content, makes it 'difficult to see how a proof of the soundness of one's preferred rules could be other than rule-circular' (3). Reasoning at the semantic level resembles too closely the rules at issue at the deductive level. By introducing a non-homophonic semantics, the workings at the semantic level can be different enough to avoid the charge of circularity. Such a semantics is then stable if both sides of a dispute can agree on the semantics, whilst still – at least initially – disagreeing on the logical rules governing the expressions for which the semantics has been given. For example, in adjudicating between a classical logician who endorses rule R, and an intuitionist logician who does not, the challenge is to find a semantics for the logical connectives involved

in rule R that remains unchanged whether or not R is endorsed, in terms of which we can then frame the dispute.

The acceptance of such a disputed rule R may then turn on whether or not the proposed semantics has a certain property, a property which comparatively viable versions of the semantics may have or lack. The dispute then becomes one over the plausibility of this property. This is effectively how the dispute over Double Negation Elimination is presented, as a matter of whether or not every statement in the language 'has a back', i.e., whether it is true of the semantics proposed that for every statement A, the set which comprises the truth-grounds of A is the orthocomplement of some set U (see page 195).[1] Rumfitt summarizes,

> I show that if we assume (B) [Each statement in the language has a back] as well as (R) [The truth-grounds of any statement form a closed set of possibilities], then our semantic theory validates all the rules of the classical propositional calculus, even in an intuitionistic metalogic. This shows how disagreement over logical laws can arise, not because the parties attach different senses to a connective or quantifier, but because they accept different postulates about the structure of the space of logical possibilities. (25)

Alternatively, it may turn out that a logic including rule R coheres with the semantics in a way that another logic does not, where 'a logic L coheres with a semantic definition of consequence if the soundness and completeness of the rules of L is derivable from that definition using the rules of L themselves' (122). In chapter 4, Rumfitt argues that, whilst his proposed exclusionary semantics is stable under the dispute between classical and intuitionistic logic, classical logic has the advantage. This is because classical logic coheres with that semantics whilst intuitionistic logic does not.

Once one understands that this is the core strategy, the line of argument of the rest of the book falls into place. For each dispute we are offered a semantics that purports to be stable under that dispute, then arguments are offered for why, in that framework, classical logic is at least defensible, in some cases preferable. This overall strategy is a central underpinning of the book, and helps the reader to keep his or her bearings throughout some technical and complex discussions. As such, it is of utmost importance to make this strategy as

[1] 'The *orthocomplement*, $U^{\perp}$, of a set of possibilities U comprises precisely those possibilities that are incompatible with every member of U. Thus $x \in U^{\perp}$ if and only if $x \perp y$ for all $y \in U$.' (167)

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clear as possible from the outset. Rumfitt does outline this strategy in his Introduction, but it could have been made plainer. Hence, I hope these remarks here will be helpful to readers.

One particularly interesting feature of the book is that Rumfitt does not take the core subject matter for granted. Rather, he begins with a deeply foundational discussion of the nature of logical laws, logical consequence, and logical necessity. He proposes that there are a variety of different implication relations that hold in different contexts. For example, certain implication relations hold between some premises and a conclusion in the context of reasoning about an electrical circuit diagram (see page 8) that would not hold in other contexts, say, a purely logical context. These implication relations are, it is argued, modal in force, and so are each associated with a kind of necessity. Crucially,

> In further glossing the notion of an implication relation, it is natural to invoke a restricted space of possibility. … Quite generally, to each space of possibilities, Π, there corresponds an implicative relation $\Rightarrow_{\Pi}$ as follows:
>
> (I) For all statements $A_1,\ldots,A_n$ and B, $A_1,\ldots,A_n \Rightarrow_{\Pi} B$ if and only if, for any possibility x in Π, if $A_1,\ldots,A_n$ are all true at x then B is true at x too. (46)

The laws of logic, then, are 'general laws governing *all* implication relations' (54). The limiting case – where some premises imply a conclusion for any implication relation – gives us the logical consequence relation: 'Some deductions will be sound … whatever implication relation provides the standard for assessing soundness. The conclusion of such a deduction may be said to *follow logically* from its premises' (56).

It is at this point that I would have found more discussion of the move from the limiting case to specifically *logical* consequence helpful. One would expect the most general implication relation – where B follows from $A_1,\ldots,A_n$ no matter what the implication – to correspond to the widest space of possibilities – i.e. such that for absolutely all possibilities, if $A_1,\ldots,A_n$ are all true at some possibility, then B is true there too. If logical consequence is the most general implication relation, then one would expect the widest space of possibilities to be logical possibilities. If one takes this in too metaphysical a spirit, however, one may run into trouble. In recent years it has been argued that metaphysical possibility is the widest kind of *genuine* possibility, and accordingly that mere logical possibilities – i.e. logical

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possibilities that are not also metaphysically possible – are 'possibilities in name only'.[2] For example, one might think that 'metaphysical necessities hold true at all possible worlds without qualification or exception'.[3] This seems *prima facie* plausible. Metaphysical necessity concerns the most general or universal, deepest features of being. If something conflicts with metaphysical necessity, then surely it can't *be*. If it is metaphysically necessary that not-p, then even if there is some sense of possibility for which it is possible that p, surely, one might argue, we shouldn't take that seriously as a genuine possibility, for according to the most general, universal, deepest features of being, such a thing could not be.

If we think of the widest space of possibilities in this way, as genuine, and therefore metaphysical, possibilities, then Rumfitt's account of so-called '*logical*' consequence would in fact give us something more inclusive. If the widest space of possibilities is in fact that of the metaphysical possibilities, then 'metaphysical implications' will count amongst those that hold 'whatever implication relation provides the standard for assessing soundness,' i.e., metaphysical implications will be included amongst the logical consequences. For example, it would be a so-called 'logical' consequence of 'Hesperus is shining', that 'Phosphorus is shining', because there is no possibility in which it is true that Hesperus is shining and false that Phosphorus is shining. But it is clear that this is not the intended account of logical consequence, and that this example is supposed to be ruled out (see page 83).

In response, note that Rumfitt further restricts logical laws – those laws that govern all implication relations – to 'structural principles' and 'sequent laws for particular logical notions' (67). The logical notions are then identified: 'their characteristic mark, I take it, is that they figure in serious deductive argument about any topic whatever' (67). These steps are treated rather briefly, however, given their crucial contribution to the overall account. I would have found more discussion helpful.

[2] Hale, 'Absolute Necessities' *Nous Supplement: Philosophical Perspectives, 10, Metaphysics* 30 (1996): page 100. See also Fine, 'Essence and Modality', *Philosophical Perspectives 8: Logic and Language* (1994): 1–16; Fine, *Modality and Tense: Philosophical Papers* (London: Clarendon Press, 2005); Hale, *Necessary Beings: An Essay on Ontology, Modality, & the Relations Between Them* (Oxford University Press, 2013); Shalkowski, 'Essentialism and Absolute Necessity', *Acta Analytica* 12 (1997): 41–56; Shalkowski, 'Logic and Absolute Necessity', *The Journal of Philosophy* CI:55–82 (2004)

[3] Hale, 'Absolute Necessities', 95.

Moreover, if one thinks of possibilities from this metaphysical perspective, one might ask why we should accept this restriction at all? If the widest space of possibilities consists of metaphysical (as opposed to logical) possibilities, and there really is the relation (I) that holds between implication relations and possibility spaces, then isn't the resulting notion of 'metaphysical implication' or 'metaphysical consequence' the one that we should be interested in, if we want to be able to preserve truth in our arguments? We would need to be offered some motivation for interest in only a restricted class of these implications, those that hold in a wider space of logical (but perhaps unreal) possibilities.

The lesson is that we should not think of the possibilities in Rumfitt's account from this metaphysical perspective. It is not important if the relevant space of possibilities are possibilities 'in name only', or not. What is important is that they correspond to those implications that hold universally, in virtue of structural principles and the rules for the logical notions. Our interest here is in logic, and so we consider a space of possibilities corresponding to implications that hold on purely logical grounds. If in some of those possibilities some metaphysical necessities are false, then no matter. However, Rumfitt writes,

> What we are seeking in the end is the optimal – or an optimal – logico-metaphysical package. Metaphysical considerations cannot be extruded from rational decisions between rival logical systems. (219)

Logical considerations generate a space of possibilities as part of the package, but metaphysical considerations may seem to demand a restriction on this. My question is thus: how should we think about the widest space of possibilities in a way that is satisfying both to the metaphysician, and to the logician, in order to deliver the optimal package?

I will close with some comments about readership and accessibility. Who is the intended readership? The relevance of the book is wider than just to those interested in the philosophy of logic. As Rumfitt remarks, 'precisely because they connect to theses in the philosophy of language, the attacks [on classical logic] I consider resonate far beyond the philosophy of logic' (22). However, one might worry that the general reader from the philosophy of language and logic may have difficulties engaging with the book.

At the end of chapter 8, Rumfitt writes

> The Father of Philosophy is said to have had ΑΓΕΩΜΕΤΡΗΤΟΣ ΜΗΔΕΙΣ ΕΙΣΙΤΩ engraved above the door to his Academy. (262)

This is doubly pertinent. First, note that in the quotation above, Rumfitt does not translate the Greek. Earlier, we encounter a joke in Latin (also untranslated) (13). This gives a flavour of the general style of the book. Second, one may translate the Greek as 'Let no one without knowledge of geometry enter'. This book contains a significant amount of mathematics. Not just areas of mathematical logic and set theory familiar to most philosophers, but also more advanced set theory, lattice theory, topology, and even some fairly detailed quantum mechanics. In my view, it is possible to understand the general shape of Rumfitt's proposals and arguments with a fairly standard amount of logical training. However, significant and detailed critical engagement with some parts of the book will require more familiarity with relevant areas of mathematics.[4]

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[4] Thanks to Bob Hale, Rosanna Keefe, and Mark Textor, for helpful comments on earlier versions of this review.