Introduction

Penelope Rush

This book is a collection of new essays around the broad central theme of the nature of logic, or the question: 'what is logic?' It is a book about logic and philosophy equally. What makes it unusual as a book about logic is that its central focus is on metaphysical rather than epistemological or methodological concerns.

By comparison, the question of the metaphysical status of mathematics and mathematical objects has a long history. The foci of discussions in the philosophy of mathematics vary greatly but one typical theme is that of situating the question in the context of wider metaphysical questions: comparing the metaphysics of mathematical reality with the metaphysics of physical reality, for example. This theme includes investigations into: on exactly which particulars the two compare; how (if) they relate to one another; and whether and how we can know anything about either of them. Other typical discussions in the field focus on what mathematical formalisms mean; what they are about; where and why they apply; and whether or not there is an independent mathematical realm. A variety of possible positions regarding all of these sorts of questions (and many more) are available for consideration in the literature on the philosophy of mathematics, along with examinations of the specific problems and attractions of each possibility.

But there is as yet little comparable literature on the metaphysics of logic. Thus the aim of this book is to address questions about the metaphysical status of logic and logical objects analogous to those that have been asked about the metaphysical status of mathematical objects (or reality). Logic, as a formal endeavour has recently extended far beyond Frege's initial vision, describing an apparently ever more complex realm of interconnected formal structures. In this sense, it may seem that logic is becoming more and more like mathematics. On the other hand, there are (also apparently ever more) sophisticated logics

describing empirical human structures: everything from natural language and reason, to knowledge and belief.

That there are metaphysical problems (and what they might be) for the former structures analogous to those in the philosophy of mathematics is relatively easily grasped. But there are also a multitude of metaphysical questions we can ask regarding the status of logics of natural language and thought. And, at the intersection of these (where one and the same logical structure is apparently both formal and mathematical as well as applicable to natural language and human reason), the number and complexity of metaphysical problems expands far beyond the thus far relatively small set of issues already broached in the philosophy of logic.

As just one example of the sorts of problems deserving a great deal more attention, consider the relationship between mathematics and logic. Questions we might ask here include: whether mathematics and logic describe the same or similar in-kind realities and relatedly, whether there is a line one can definitively draw between where mathematics stops and logic starts. Then we could also ask exactly what sort of relationship this is: is it one of application (of the latter to the former) or is it more complex than this?

Another central problem for the metaphysics of logic is that of pinning down exactly what it is that logic is supposed to range over. Logic has been conceived of in a wide variety of ways: e.g. as an abstraction of natural language; as the laws of thought; and as normative for human reason. But, what is the 'thought' whose structure logic describes; how natural is the natural language from which logic is abstracted?; and to what extent does the formal system actually capture the way humans ought to reason?

As touched on above, a key metaphysical issue is how to account for the apparent 'double role' – applying to both formal mathematical and natural reasoning structures – that (at least the main) formal logical systems play. This apparent duality lines up along the two central, indeed canonical applications of logic: to mathematics and to human reason, (and/or human thought, and/or human language). In many ways, the first application suggests that logic may be objective – or at least as objective as mathematics, in the sense that, as Stewart Shapiro puts it (in this volume) we might say something "is objective if it is part of the fabric of reality". This in turn might suggest an apparent human-independence of logic. The second application, though, might suggest a certain subjectivity or inter-subjectivity; and so in turn an apparent human-dependence of logic, insofar as a logic of reason may appear dependent on actual human thought or concepts in some essential way.

Both the apparent objectivity and the apparent subjectivity of logic need to be accounted for, but there are numerous stances one might take within this dichotomy, including a conception of objectivity that is nonetheless human-dependent. In Chapter 4, Solomon Feferman reviews one such example in his non-realist philosophy of mathematics, wherein "the objects of mathematics exist only as mental conceptions [and] ... the objectivity of mathematics lies in its stability and coherence under repeated communication". Others of the various positions one might take up within this broad-brush conceptual field are admirably explored in both Stewart Shapiro's and Graham Priest's chapters, though from quite different stand points: Shapiro explores the nuances and possibilities in conceptions of objectivity, relativity, and pluralism for logic, whereas Priest looks at these issues through the specific lens afforded by the question whether or not logic can be revised.

There are, then, a variety of possible metaphysical perspectives we can take on logic that, particularly now, deserve articulation and exploration. These include nominalism; naturalism; structuralism; conceptual structuralism; nihilism; realism; and anti-(or non-)realism, as well as positions attempting to steer a path between the latter two. The following essays cover all these positions and more, as defended by some of the foremost thinkers in the field.

The first part of the book covers some of the main philosophical positions one might adopt when considering the metaphysical nature of logic. This section covers everything from an extreme realism wherein logic may be supposed to be completely independent of humanity, to various accounts and various degrees in which logic is supposed to be in some way human-dependent (e.g. conceptualism and conventionalism).

In the first chapter I explore the feasibility of the notion that logic is about a structure or structures existing independently of humans and human activity. The (typically realist) notion of independence itself is scrutinised and the chapter gives some reasons to believe that there is nothing in principle standing in the way of attributing such independence to logic. So any benefits of such a realism are as much within the reach of the philosopher of logic as the philosopher of mathematics.

In the second chapter, Jody Azzouni explores whether logic can be conceived of in accordance with nominalism: a philosophy which might be taken to represent the extreme opposite of realism. Azzouni argues the case for logical conventionalism, the view that logical truths are true *by convention*. For Azzouni, logic is a tool which we both impose by convention on our own reasoning practices, and occasionally also to evaluate

them. But Azzouni shows that although there seems to be a close relationship between conventionality and subjectivity, logic's being conventional does not rule out its also applying to the world.

Stewart Shapiro, in the third chapter, argues the case for logical relativism or pluralism: the view that there is "nothing illegitimate" in structures invoking logics other than classical logic. Shapiro defends a particular sort of relativism whereby different mathematical structures "have different logics", giving rise to logical pluralism – conceived of as "[the] view that different accounts of the subject are equally correct, or equally good, or equally legitimate, or perhaps even (equally) true".

Shapiro's chapter looks in some depth at the relationship between mathematics and logic, identified above as a central problem for our theme. But in particular, it investigates the extent to which logic can be thought of as objective, given the foregoing philosophy. He offers a thorough, precise, and immensely valuable analysis of the central concepts, and clarifies exactly what is and is not at stake in this particular debate.

In the fourth chapter, Solomon Feferman examines a variety of logical non-realism called conceptual structuralism. Feferman shares with Shapiro a focus on the relationship between mathematics and logic, extending the case for conceptual structuralism in the philosophy of mathematics to logic via a deliberation on the nature and role of logic in mathematics. He draws a careful picture of logic as an intermediary between philosophy and mathematics, and gives a compelling argument for the notion that logic, as (he argues) does mathematics, deals with truth in a given conception.

According to Feferman's account, truth in full is applicable only to definite conceptions. On this picture, when we speak of truth in a conception, that truth may be partial. Thus classical logic can be conceptualised as the "logic of definite concepts and totalities", but may itself be justified on the basis of a semi-intuitionist logic "that is sensitive to distinctions that one might adopt between what is definite and what is not". Feferman shows how allowing that "different judgements may be made as to what are clear/definite concepts", affords the conceptual structuralist a straightforward, sensible and clear understanding of the role and nature of logic.

Penelope Maddy, in the fifth chapter, offers a determinedly second-philosophical account of the nature of logic, presenting another admirably clear and sensible account, focusing in this case on the question why logic is true and its inferences reliable. 'Second Philosophy' is a close cousin of naturalism as well as a form of logical realism and involves persistently bringing our philosophical theorising back down to earth.

In Maddy's words: "The Second Philosopher's 'metaphysics naturalized' simply pursues ordinary science". Thus Maddy investigates the question from this 'ordinary' perspective, beginning with a consideration of rudimentary logic, and gradually building up (via idealisations) to classical logic. On this account, logic turns out to be true and reliable in our actual (ordinary, middle-sized) world partly because that actual world shares the formal structure of logic (or at least rudimentary logic). Maddy gives an extensive account of some of the ways we might come to know of this structure, presenting recent research in cognitive science that supports the notion that we are wired to detect just such a structure. She then offers the (tentative) conclusion that classical logic (as opposed to any non-classical logic) is best suited to describe the physical world we live in, despite the fact that classical logic's idealisations of rudimentary logic are best described as 'useful falsifications'.

In the final two chapters of the first part, Curtis Franks questions the assumption underpinning any metaphysics of logic at all: namely that there is "a logical subject matter unaffected by shifts in human interest and knowledge"; and Mark Steiner unpicks Wittgenstein's idea that "The rules of logical inference are rules of the language game".

Steiner points out that for Wittgenstein "There is nothing akin to 'intuition', 'Seeing' and the like in following or producing a logical argument. Instead we [only] have regularities induced by linguistic training". So, Steiner argues, supposing that logic is grounded by anything other than the regularities that ground rule following (say by some objective 'fact' according to which its rules are determined), is engaging in a kind of 'covert Platonism'.

Steiner identifies the key difference (for Wittgenstein) between mathematics and logic as the areas their respective rules govern: whereas both mathematical and logical rules govern linguistic practices, (only) mathematical rules also govern non-linguistic practices. Interestingly, while Steiner argues that the line between mathematics and logic is thus more substantial than many may think, Franks argues that the line between maths and logic is illusory, based on a need to differentiate the patterns of reasoning we have come to associate with logic from other patterns of reasoning, which itself is grounded on nothing more than a baseless psychological or metaphysical preconception.

Franks argues that logicians deal not with truth but with the "relationships among phenomena and ideas" – and agrees with Steiner that looking for any further 'ontological ground' is misconceived (note, though, that Steiner himself does not commit himself to the views he attributes to

Wittgenstein. Rather he gives what he takes to be the best arguments in Wittgenstein's favour). As something of a side note, it is interesting to compare Sandra Lapointe's discussion of Bolzano's notion of definition (in Part II) to that which Franks presents on behalf of Socrates. Lapointe argues that, for Bolzano, there is more to a definition than merely fixing its extension, whereas Franks argues that Socrates was right to prioritise the fixing of an extension first before enquiring after the nature or essence of a thing. Steiner's discussion of the Wittgensteinian distinction between explanation and description is also relevant here. This debate touches on another important subtheme running throughout the book: the nature and role of intentional and extensional motivations of logical systems; and the related tension (admirably illustrated by Franks' discussion of the development of set theory) between appeals to form/formal considerations and appeals to our intuitions.

Both Steiner's Wittgenstein and Franks agree that the image of logic as a kind of 'super-physics' needs to be challenged, even eliminated; but each takes a different approach to just how this might be achieved, with Franks arguing for logical nihilism, and Steiner going to pains to show how, for Wittgenstein, the rules of logic ought to be conceived as akin to those of grammar and as nothing more than this.

The next part of the book gives an historical overview of past investigations into the nature of logic as well as giving insights into specific authors of historical import for our particular theme.

In the first chapter of this section Paul Thom discusses the thoughts of Aristotle and the tradition following him on logic. Thom focuses particularly on what sort of thing, metaphysically speaking, the objects of logic might be. He traces a gradual shift (in Kilwardby's work) from a conception of logic as about only linguistic phenomena, through a conception wherein logic is also understood as also being about reason, to the inclusion of 'the natures of things' as a possible foundation of logic. Kilwardby considers a view whereby the principal objects of logic: 'stateables', are not some *thing* at all (at least not in themselves), insofar as they do not belong to any of Aristotle's categories. Kilwardby opposes this view on the basis of a sophisticated and complex argument to the effect that there may be objects of logic that are human dependent but also external to ourselves, and can be considered both things of and things about nature itself. These insights are clearly relevant to the modern questions we ask about the metaphysics of logic and resonate strongly with the themes explored in the first part. The range of possibilities considered offer a fascinating and fruitful look into the historical precedents of the questions

about logic still open today: e.g. Thom notes that for Aristotle, the types of things that can belong to the categories are 'outside the mind or soul', and so Kilwardby's analysis clearly relates to our modern question as to the possible independence and objectivity of logic. The complexity of that question is brought to the fore in Kilwardby's detailed consideration of the various 'aspects' under which stateables can be considered, and according to which they may be assigned to different categories.

Thom's chapter goes on to offer a framework for understanding later thinkers and traditions in logic, some of which (e.g. Bolzano in Lapointe's chapter) are also discussed in this part. His concluding section ably demonstrates that understanding the history of our questions casts useful light on the modern debate.

Gyula Klima also discusses strategies for dealing with the two way pull on logic – from its apparent abstraction from human reason and from its apparent groundedness in the physical world. Klima focuses on the scholastics, comparing the semantic strategies of realists and nominalists around Ockham's time. One of these was to characterise logic as the study of 'second intentions' – concepts of concepts. Klima points out that when logic is conceived of in this way, the core-ontology of real mind-independent entities could in principle have been exactly the same for "realists" as for Ockhamist "nominalists"; therefore, what makes the difference between them is not so much their ontologies as their different conceptions of concepts, grounding their different semantics.

Klima argues that extreme degrees of ontological and semantic diversity and uniformity mark out either end of a "range of possible positions concerning the relationship between semantics and metaphysics, [from] extreme realism to thoroughgoing nominalism" and points out how the conceptualisation of the sorts of things semantic values might be varies according to where a given position sits within this framework. His chapter illuminates the metaphysical requirements of different historical approaches to semantics and the way in which the various possible metaphysical commitments we make come about via competing intuitions regarding diversity: whether we locate diversity in the way things are or in the way we speak of or conceptualise them.

In the next chapter, Ermanno Bencivenga picks up a thought Thom touches on in his closing paragraph – namely that our modern conception of logic appears to have lost touch with the relevant ways in which actual human reason can go wrong other than by not being valid. Offering a Kantian view, Bencivenga suggests we adjust our conception of logic to that of almost any structure we impose on language and experience, just so

long as it is a holistic endeavour to uncover how our language acquires meaning. In this way almost all of philosophy is logic, but not all of what we commonly call logic makes the grade. For Bencivenga, logic should focus on meaning: on the way language constructs our world. From this perspective, the relationship of logic to reason is just one of many connections between the world we create and the internal structure of any given logic. For example, while appeals to reason may motivate logic's claims, so too do appeals to ethos and pathos.

Sandra Lapointe looks at the sorts of motivations and reasons we might have for adopting a realist philosophy of logic, pointing out that these reasons may not themselves be logical and developing a framework within which different instances of logical realism can be compared. Lapointe examines Bolzano's philosophy in particular and shows how his realism may best be thought of as instrumental rather than inherent: adopted in order to make sense of certain aspects of logic rather than as a result of any deep metaphysical conviction.

Lapointe's chapter shows how Bolzano's works cast light on a wide array of issues falling under our theme, from his evocative analogy between the truths of logic and the spaces of geometry to his critique of Aristotle's criteria for validity. Lapointe's discussion of the latter is worth drawing attention to as it deals with the topic mentioned earlier – of the tension between external and intensional; and formal and non-formal motivations for logical systems. Lapointe compares the results of Bolzano's motivations with those of Aristotle for the definition of logical consequence and in so doing, identifies some central considerations to help further our understanding of this topic.

The final part of the book deals with the specific issues of the possible revision of logic, the presence of contradiction, and the metaphysical conception of logical truth.

Graham Priest's chapter deals with the question of the revisability of logic and in so doing also offers a useful overview of much of what is discussed in earlier sections and indeed throughout this book. Priest outlines three senses of the term 'logic' and asks of each whether it can be revised, revised rationally, and (if so) how.

In some ways, Priest's paper dovetails with Shapiro's discussion of the possible criteria used to judge the acceptability of a theory, and draws a conclusion similar to that of Shapiro's 'liberal Hilbertian': i.e. "[that] There is no metaphysical, formal, or mathematical hoop that a proposed theory must jump through. There are only pragmatic criteria of interest and usefulness" – which, for Priest, are judged against the requirements of

its application(s) and by "the standard criteria of rational theory choice". And like Shapiro's, Priest's chapter is an immensely valuable overview of the key concepts informing any metaphysics of logic.

In the next chapter, Jc Beall, Michael Hughes, and Ross Vandegrift look at different repercussions of different attitudes toward "glutty predicates" – predicates which "in virtue of their meaning or the properties they express . . . [are] both true and false". Their chapter shows how our various theories and attitudes about such predicates may motivate different formal systems. The formal systems in question here are Priest's well-known LP and the lesser-known LA advanced by Asenjo and Tamburino. The upshot of the discussion is that the latter will suit someone metaphysically "commited to all predicates being essentially classical or glutty" and the former someone for whom "all predicates [are] potentially classical or glutty".

Thus, Beall et al. draw out some interesting consequences of the relationships between our intuitions and theories regarding the metaphysical, the material, and the formal aspects of logic. They highlight both the potential ramifications of the role we afford our metaphysical commitments and the ramifications of the particular type of commitments they might be. So while Beall et al. look in particular at a variety of metaphysical theories about contradiction, and the impact of these on two formal systems, their discussion also gives some general pointers to the way in which our metaphysical beliefs impact on other central factors in logic: crucially including the creation of the formal systems themselves and the evaluation of their differences.

Tuomas Tahko finishes the book by examining a specific realist metaphysical perspective and suggesting it as another approach we might take to understand logic, especially to interpret logical truth. His case study offers an interpretation of paraconsistency which contrasts nicely with that offered in the penultimate chapter. Tahko's approach is to judge logical laws according to whether or not they count as genuine ways the actual world is or could be. From this perspective, he argues, exceptions to the law of non-contradiction now appear more as descriptions of features of our language than of reality. Thus he argues that the realist intuition grounding logic in how the world is (or could be) gives us good reason to preserve the LNC. Tahko's metaphysical interpretation of logical truth also offers an interesting perspective on logical pluralism. From Tahko's metaphysical perspective, pluralism may be understood as about subsets of possible worlds representing genuine possible configurations of the actual world. Tahko's chapter is a meticulous investigation into the links, both

already in place and that (from this perspective) ought to be, between an interesting set of metaphysical intuitions and those laws of logic we take to be true.

In all, this book ranges over a vast terrain covering much of the ways in which our beliefs about the role and nature of logic and of the structures it describes both impact and depend on a wide array of metaphysical positions. The work touches on and freshly illuminates almost every corner of the modern debate about logic; from pluralism and paraconsistency to reason and realism.