Introduction

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Abstract and Keywords

The latter half of the twentieth century witnessed an 'intensional revolution': a great collective effort to analyse notions which are absolutely fundamental to our understanding of the world and of ourselves – from meaning and information to knowledge, belief, causation, essence, supervenience, conditionality, as well as nomological, metaphysical, and logical necessity – in terms of a single concept. This was the concept of a …

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Possible worlds found applications in logic, metaphysics, semantics, game theory, information theory, artificial intelligence, the philosophy of mind and cognition. In 1986, in *On the Plurality of Worlds*, David Lewis called possible worlds 'a philosophers' paradise'. Whatever view one had on the kinds of things possible worlds are, there was widespread agreement on their being an indispensable theoretical tool.

That paradise has turned out to be full of problems. These have emerged in piecemeal fashion, as difficulties for this or that application of the possible worlds paradigm. It seems to us, however, that the difficulties revolve around a

single issue. Most of those fundamental notions are *hyperintensional*: they require distinctions the standard possible worlds apparatus cannot easily make.

When we set out to write about impossible worlds – ways things could *not* have been – we decided to set our narrative against the background of an envisaged twenty-first century 'hyperintensional revolution'. A number of accounts have been developed, which **(p.2)** qualify as hyperintensional in some sense. They range from two-dimensional semantics (Chalmers 2006), to theories of aboutness (Yablo 2014), truthmaker semantics (Fine 2017), metaphysical grounding (Correia and Schnieder 2012), structured propositions (King 2011), transparent intensional logic (Duzi et al. 2010), and various non-classical logical approaches (Dunn and Restall 2002). How such theories, or families thereof, are connected to each other and how their relative merits can be assessed, are at present largely open questions. But whatever position impossible worlds take in this landscape, we believe that they will play a role in the revolution, and we felt the time was ripe for a book providing guidance through the burgeoning literature on the subject.

This book includes an opinionated introduction to theories and uses of impossible worlds. (A shorter and simplified presentation can be found in our 'Impossible Worlds' entry in the *Stanford Encyclopedia of Philosophy*.) We have our own preferences on the metaphysics of impossible worlds and the logical and philosophical applications they afford. We don't hide those preferences; but we have tried to provide fair accounts of the alternative views and to assess them in a balanced way.

The book also includes our own original proposals on a number of topics involving impossible worlds. Some of these have appeared previously in print, although often not in the form they appear here. We have drawn on material from Berto's papers 'Impossible Worlds and Propositions' (*The Philosophical Quarterly*, 2010), 'On Conceiving the Inconsistent' (*Proceedings of the Aristotelian Society*, 2014), 'Impossible Worlds and the Logic of Imagination' (*Erkenntnis*, 2017), 'Conceivability and Possibility: Some Dilemmas for Humeans' (with Tom Schoonen, *Synthese*, 2018), 'Truth in Fiction, Impossible Worlds, and Belief Revision' (with Chris Badura, *Australasian Journal of Philosophy*, 2018), 'Williamson on Counterpossibles' (with Rohan French, Graham Priest, and Dave Ripley, *Journal of Philosophical Logic*, 2018), and on Berto's book *Ontology and Metaontology* (with Matteo Plebani, Bloomsbury, 2015). We have drawn on material from Jago's papers 'Against Yagisawa's Modal Realism' (*Analysis*, 2013), **(p.3)** 'The Content of Deduction' (*Journal of Philosophical Logic*, 2013), 'Recent Work in Relevant Logic' (*Analysis*, 2013), 'The Problem of Rational Knowledge' (*Erkenntnis*, 2013), and on Jago's book *The Impossible* (Oxford University Press, 2014). We are very grateful to all the editors and publishers for permission to use these works.

Outline of the Book

The book is divided into three parts. Part I deals with foundational issues. In Chapter 1, we survey a number of applications of possible worlds; find them all wanting; trace the problem back to hyperintensionality; and suggest that impossible worlds may help. We present various definitions of the notion of an impossible world from the literature. Such worlds make sense only if we can genuinely think about the impossibilities they represent. We argue that we can.

A central philosophical issue with worlds, possible or impossible, is how they represent what they represent. This is obviously connected to the problem of what kind of things they are. In Chapter 2, we discuss a number of different proposals. Perhaps impossible worlds are metaphysically different from possible worlds, and represent in a different way. Or perhaps they are metaphysically on a par with possible worlds. Impossible worlds may be taken as 'genuine' entities which, like Lewisian possible worlds, represent something as being an F by having a real F as a part. Or, they may be taken as non-existent objects. Or as abstract entities which, like the objects of general object theory, represent by encoding. Or they may be taken as primitive entities, with no questions asked on how they represent. Or maybe there are no such worlds: we should take a fictionalist stance, and just make believe that there are.

We argue that all such views face difficulties, and conclude that some *ersatz* approach fares the best. After characterizing the notion of an ersatz world in general terms, we notice that there are different ways to specify the view. We delve into the options in Chapter 3. Ersatz possible worlds can be understood as maximal **(p.4)** states of affairs, maximal properties, recombinations of bits of actuality, maps, or things built out of propositions or sentences. We argue that, when extended to impossible worlds, most of these approaches face issues: they either collapse into other views, or are not general enough to accommodate all the impossibilites we may want. We conclude that linguistic ersatzism, which views worlds as constructions from sentences of a 'worldmaking' language, is the most promising metaphysics of impossible worlds. We close Chapter 3 by discussing a problem it, together with the other variants of ersatzism, faces: the problem of aliens.

Parts II and III of the book are about the logical and philosophical applications of impossible worlds. The boundary between logic and philosophy is to some extent arbitrary, as is our partition of the topics. Part II covers epistemic, doxastic, and various non-classical logics. Part III covers applications connected to issues in mainstream epistemology, information theory, the philosophy of fiction, and topics in semantics and the philosophy of language. But Part II is not completely free from philosophical discussion and Part III is not completely devoid of formalism, although we have tried to keep technicalities under control throughout the book.

In Part II, Chapter 4, we introduce normal modal logics and their frame semantics. We then show how impossible worlds can be used to model *non-normal* modal logics, in which the Rule of Necessitation is not valid. We discuss further uses, involving *non-adjunctiveness* and *non-primeness*. Two general patterns emerge in these applications. Firstly, impossible worlds are generally understood as 'logic violators': worlds where some logical law fails. Secondly, in semantics of this kind truth conditions are often not spelled out uniformly: they differ between possible and impossible worlds. This raises a philosophical problem, whose discussion is postponed until Part III: what of compositionality, a basic requirement for a theory of meaning?

Chapter 5 deals with applications in epistemic and doxastic logic. Here the central topic is the problem of logical omniscience. The standard view models agents as knowing or believing all logical **(p.5)** truths and all logical consequences of what they know or believe. We discuss some approaches to avoiding this consequence which don't use impossible worlds, and find them wanting. A naïve impossible worlds approach can easily deliver a view which avoids this problem. But it faces a deeper problem of *bounded rationality*: how should the accessible impossible worlds be constrained, so as to model a moderately rational though not logically omniscient agent? We argue that closing worlds under a weaker-than-classical logic won't help. We also critically discuss a dynamic approach using impossible worlds, on which epistemic states evolve gradually towards closure.

Chapter 6 deals with the role impossible worlds play in the semantics of relevant logics. These are non-classical logics that aim to avoid the paradoxes of the material and strict conditional. The mainstream semantics here includes non-normal points of evaluation, which are naturally interpreted as impossible worlds. The discussion has revolved around making sense of the truth conditions for the relevant conditional and negation. We discuss information-theoretic interpretations of impossible worlds in this setting, and raise some issues. We also discuss interpretations guided by general views on conditionality and an interpretation in terms of truthmaking.

Chapter 7 presents an application of impossible worlds to modelling acts of imagination. We focus on a semantics for hyperintensional operators capturing a kind of mental simulation. We discuss a number of plausible constraints on such operators, including non-monotonicity, non-primeness, and a 'Principle of Imaginative Equivalents' that limits the hyperintensional anarchy of imagining.

In Part III, Chapter 8 revolves around a very general philosophical issue: is hyperintensionality a genuine phenomenon? Or is it a feature to be explained away, and which therefore does not require us to amend the standard possible worlds apparatus? We consider arguments for the latter view, and find them unsuccessful. We then focus on a general notion of hyperintensional content, and

discuss two issues concerning it. Firstly, any hyperintensional theory of content must address the problem of granularity: how fine-grained must the relevant hyperintensional distinctions be? Secondly, we return to the **(p.6)** issue, flagged in Chapter 4, of non-uniform truth conditions, which raises a compositionality objection for theories of content. We argue that impossible worlds accounts can deliver a fully compositional theory of content.

Chapter 9 is about information, which we conceptualize semantically, in terms of ruling out scenarios. We argue that Frege's puzzle of informative identities, and the informativeness of logical inferences, can be accounted for hyperintensionally, using impossible worlds. In our favourite analysis, it may be indeterminate whether a given logical inference is informative. We also sketch an analysis of informative content in terms of what is said by a speaker making an utterance.

Chapter 10 deals with epistemic and doxastic contents. Here we focus on how to model a realistic cognitive agent, striking a balance between the implausible extremes of logical omniscience and complete logical ignorance. This is the problem of bounded rationality, flagged in Chapter 5. The belief states of such an agent seem to be closed under 'easy', trivial logical consequence, but not under full logical consequence. Yet the former seems to imply the latter. Our solution is that, while some trivial closure principle must fail in a belief state, it is indeterminate just where any such failure occurs. We give formal models of belief states so structured. These entail that nobody genuinely believes an outright contradiction. We close the chapter discussing the issue of people who claim they do.

Chapter 11, written with Chris Badura, applies impossible worlds to the analysis of truth in fiction and the metaphysics of fictional objects. We show that inconsistent fictions are naturally handled via a space of worlds including impossible worlds, and that truth in fiction can be understood as a kind of simulated belief revision over such a space, triggered by the fiction's explicit content. We then discuss fictionalist, realist, and Meinongian accounts of fictional characters, their problems, and their relative merits. We show how impossible worlds can help to improve on some of these accounts.

Chapter 12, written with Rohan French, Graham Priest, and Dave Ripley, is about counterfactuality. The starting point here is the intuitive view that counterpossibles – counterfactual conditionals **(p.7)** with impossible antecedents – are not all vacuously true, independently of the truth value of the consequent. We discuss objections to the effect that this intuition should be explained away, and find them unconvincing. We then offer a non-vacuist semantics for counterpossibles that resorts to impossible worlds. This triggers a discussion of the so-called 'Strangeness of Impossibility Condition' (SIC). This relates to the idea that some pairs of worlds are closer to one another than

others, and that we evaluate counterfactuals by considering the closest worlds. The (SIC), then, holds that, for any given possible world, any impossible world is further away from it than any possible world is. In the semantics, the substitutivity of rigidly coreferential terms fails in counterfactual contexts. This is arguably a problem. Another objection revolves around making sense of arguments by *reductio ad absurdum* in mathematical practice. We argue that both objections can be met.

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