Are Impossible Worlds Trivial?

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Forthcoming in *The Logica Yearbook 2012*

Abstract: Theories of content are at the centre of philosophical semantics. The most successful general theory of content takes contents to be sets of possible worlds. But such contents are very coarse-grained, for they cannot distinguish between logically equivalent contents. They draw intensional but not *hyperintensional* distinctions. This is often remedied by including *impossible* as well as possible worlds in the theory of content. Yet it is often claimed that impossible worlds are metaphysically obscure; and it is sometimes claimed that their use results in a trivial theory of content. In this paper, I set out the need for impossible worlds in a theory of content; I briefly sketch a metaphysical account of their nature; I argue that worlds in general must be very fine-grained entities; and, finally, I argue that the resulting conception of impossible worlds is not a trivial one.

Keywords: Impossible worlds, content, hyperintensionality, semantics

1 Introduction

Theories of content are at the centre of philosophical semantics. One task is to assign particular contents to particular kinds of expressions. But a prior, more basic task is to give a theory of what contents in general are. This is a metaphysical endeavour, in that the question concerns the *nature* of contents, although it must answer to the semantic data. The most successful and thoroughgoing theory of content currently on offer treats the contents of sentences as sets of possible words (Lewis 1986; Stalnaker 1976a;b). These contents can be thought of as *propositions*. Contents of sub-sentential terms can then be thought of as functions on possible worlds which, when combined in a way that mirrors the syntax of the corresponding sentence, produces the content (a set of worlds) of that sentence (von Fintel and Heim 2007).

This approach to content meshes very well with the *modal epistemic logic* approach to modelling knowledge and belief (Hintikka 1962), in terms of epistemic and doxastic accessibility relations between worlds. Indeed, if R_i is agent i's epistemic accessibility relation then, given a world w, the set of worlds $\{u \mid Rwu\}$ can be thought of as the content of i's epistemic state at w. She knows that A at w iff the proposition $\langle A \rangle$ includes that content, i.e. $\{u \mid Rwu\} \subseteq \langle A \rangle$. The possible worlds theory of content also meshes very well with Bar-Hillel and Carnap's (1953) analysis of information.

The major thorn in the possible worlds analysis of content (and of knowledge, belief, information and cognate notions) is that it is able to analyse intensional but not *hyperintensional* operators. An operator 'O' is hyperintensional iff 'OA' and 'OB' can take different values for some logically equivalent 'A' and 'B'. 'Knows that', 'believes that', 'has the information that' and 'has the content that' are all hyperintensional operators (although many theorists have tried to argue to the contrary). In the case of knowledge, for example, the non-hyperintensionality of

the possible worlds account results in the notorious *logical omniscience* problem (Hintikka 1975; Stalnaker 1991), whereby agents are treated as automatically knowing all logical truths and all consequences of what they know.

One solution to these issues (hyperintensionality in general and logical omniscience in particular) is to supplement the domain of possible worlds with *impossible* worlds. These are worlds according to which impossible things happen. They stand to Escher drawings as possible worlds stand to depictions of possible situations. In my view, the addition of impossible worlds to a worlds-based approach provides the best account we can give of epistemic and doxastic notions of content, including knowledge and belief states (Hintikka 1975), cognitive significance and information (Chalmers 2010; Jago 2009a), and the content of informative deduction (Jago 2012b).

Yet acceptance of impossible worlds in philosophical theorising is far from the norm. We lack a persuasive metaphysical theory of their nature and of how they represent. There are, moreover, worries that impossible worlds either fail to overcome the problems they were designed to solve or else are too trivial to deserve our respect.

My aims in this paper are to set out the need for impossible worlds in a theory of content (§2); to sketch briefly a metaphysical account of the nature of possible and impossible worlds (§3); to argue for a highly fine-grained theory of impossible worlds (§4) and, finally, to argue that the resulting conception of impossible worlds is not a trivial one (§5).

2 The Need for Impossible Worlds

The case for impossible worlds (in addition to possible worlds) can be made by (i) highlighting deficiencies in the possible worlds account, and (ii) arguing that the addition of impossible worlds best overcomes these problems. The problems I have in mind concern hyperintensional concepts such as knowledge, belief, information and content in general. In this section, I'll review those problems and argue briefly that the impossible worlds approach is the best solution.

Knowledge: Suppose you and I play a game of chess (with no time controls) in which a draw counts as a win for black. It is then a surprising mathematical fact that, at any stage of the game, one of us has a *winning strategy*: there is a function from the game's previous moves to that player's next move which guarantees victory, regardless of how the other player plays. Suppose σ is a winning strategy for me, which tells me to move my queen to e7 next. Yet I don't move my queen to e7 and go on to lose the game. Had I known that Qe7 was recommended by a winning strategy, I would have made that move. So it is clear that I *didn't* know that σ is a winning strategy, even though σ's being a winning strategy for me followed mathematically from the state of the game at that time.[1]

1. If I really did know all consequences of what I know, I will know a winning strategy in 50% of these chess games. But then I would know how to win at least 50% of the games, *regardless of who my opponent is!* It seems to me outlandish folly of the highest order to think that I could *ever* beat

Information: Gaining information amounts to narrowing down one's set of epistemically accessible worlds. But no logical or mathematical truth rules out any (logically) possible world. So the possible worlds approach must say, with Wittgenstein (1922, §6.11, §2.19, §6.12), that all logical and mathematical truths are utterly uninformative (and, according to Wittgenstein, unsurprising too). But of course there *are* surprises in logic and mathematics, as a cursory leaf through the technical literature shows.[2] Students who happily accept the truth-table for the material conditional '→' are surprised to learn that, for any sentences 'A' and 'B' whatsoever, in any situation either '$A \to B$' or '$B \to A$' will be true. Even preeminent logicians are occasionally surprised by their results, as the reaction to early results in model theory shows.[3] A natural way to explain what makes a given truth surprising is to appeal to its informativeness. If logical results were not informative, then they would never be surprising. So logical truths can be informative.

Content: The possible worlds approach treats propositions as sets of possible worlds. As a consequence, logically equivalent propositions are numerically identical to one another. This is Stalnaker's principle (I) (1976a, 9). But the principle is incorrect. We can bring out what's wrong with it by focusing on what a given proposition (or the sentence expressing it) is *about*, or by focusing on what *makes* a given proposition true. One job of a proposition is to give the content of the sentence expressing it, and in particular, to specify what that sentence is about. Hence, if sentences 'A' and 'B' express the same proposition in a common context c, then they should be about the very same things (in c).

As a consequence, the possible worlds approach entails that logically equivalent sentences are always about the very same things (in any context). But this is not so. The sentence

(1) Puss is crafty ∨ Puss isn't crafty

is about Puss (and perhaps about *craftiness* too), but not Rover. By contrast,

(2) Rover is snoring ∨ Rover isn't snoring

is about Rover (and perhaps about *snoring* too), but not Puss. Thus (1) and (2) are about completely different things. Yet (1) and (2) are logically equivalent, contradicting the consequence of the possible worlds approach.

We can make essentially the same point by focusing on the notion of what makes a proposition true or false. The fact *that Puss is crafty* (but not the fact *that Rover is snoring*) makes (1) true. The fact *that Rover is snoring* (but not the fact *that Puss is crafty*) makes (2) true. Hence by Leibniz's Law (1) and (2) express

Kasparov or Fischer, let alone in 50% of these games!

2. As Dummett says, 'when we contemplate the wealth and complexity of number-theoretic theorems, … we are struck by the difficulty of establishing them and *the surprises they yield* (Dummett 1978, 297, my emphasis).

3. Löwenheim's theorem perplexed Skolem, who gave the first correct proof of it (Skolem 1922). Skolem took the result to be paradoxical.

distinct propositions, despite being logically equivalent. So propositions cannot be sets of possible worlds.

Counterfactuals: A worlds-based account provides the best semantics for counterfactuals (Lewis 1973; Stalnaker 1968). Yet to make good sense of *counter-possible* conditionals, such as

(3) If Linear Logic had been the One True Logic, then the Tonk rules would have been valid rules of inference.

(4) If Fermat's Last Theorem had been false, then I would have been a lemon

we require impossible as well as possible worlds to be part of the story.[4] Both (3) and (4) are trivially true, according to the Stalnaker-Lewis approach; yet each is clearly false. On the worlds-based approach, false counterfactuals require worlds where the antecedent is true and the consequent is false. Such worlds are, of course, impossible; hence the need for impossible worlds.

One can of course resist these moves in various ways. One could flatly deny that epistemic and counterfactual concepts are hyperintensional.[5] (I find that view implausible.) Or one could adopt a *structuralist* approach, by supplementing the possible worlds account with linguistic structure, rather than impossible worlds.[6] Or one could abandon worlds-based approaches altogether.

The structuralist approach on its own does not make all of the fine-grained distinctions between contents that we require. Consider:[7]

(5) All woodchucks are woodchucks

(6) All woodchucks are whistle-pigs

Since whistle-pigs are woodchucks (and necessarily so), a structuralist view which takes semantic values (written '$[\![-]\!]$') of nouns to be extensions or intensions will hold that $[\![\text{woodchucks}]\!] = [\![\text{whistle-pigs}]\!]$. If so, both (5) and (6) express the proposition:[8]

(5′) $\langle\langle[\![\text{All}]\!], [\![\text{woodchucks}]\!]\rangle, \langle[\![\text{are}]\!], [\![\text{woodchucks}]\!]\rangle\rangle$

4. Brogaard and Salerno (2008), Nolan (1997), Read (1995) and Routley (1989) discuss the impossible-worlds approach to counter-possible conditionals.

5. Lewis (1996) and Stalnaker (1984) defend this view. Stalnaker in particular is at pains to explain away the *appearance* of hyperintensionality via a metalinguistic approach. But my failure to know how best to proceed in chess is *not* a failure to grasp what words mean.

6. Chalmers (2011), Cresswell (1985), King (2007), Salmon (1986) and Soames (1987) defend structuralist theories.

7. The example is Dave Ripley's (2012).

8. I'm assuming (with Ripley (2012)) that the relevant syntactic structure here consists of a quantifier-phrase 'All woodchucks' and a complement 'are woodchucks', rather than a universal quantifier '$\forall x$' attached to an open sentence 'x is a woodchuck'.

Yet, whilst everyone knows (5), one might not believe (6). Ripley (2012) considers the case of Tama, who 'knows he is allergic to whistle-pigs, and knows that he has just been bitten by a woodchuck' (2012, 9). Tama fears that (6) is true, but surely no one fears that (6), as a trivial logical truth, is true! So the structuralist approach is not suitably hyperintensional for our needs.

Contrast this with the impossible worlds approach. It is impossible that whistle-pigs are not woodchucks; so, according to some impossible world, whistle-pigs are not woodchucks. There are also incomplete worlds, representing nothing about woodchucks. Hence there are worlds enough to provide distinct contents for (5) and (6).

The final option, of abandoning the worlds-based approach altogether, is extreme. Hyperintensionality worries aside, the approach is the most comprehensive and systematic account of content on offer. It is one of the key theories in formal semantics and is used widely in computer science, artificial intelligence and game theory. We should not abandon the benefits that the theory brings lightly. As always in science, the rational approach is to begin with our best theory and modify it so as to include phenomena which it does not currently accommodate. For the remainder of the paper, therefore, I will assume that there is desirable theoretical utility to be gained from working with impossible as well as possible worlds.

3 The Nature of Worlds

One might take non-actual worlds to exist in much the same way that our own world – the universe in its entirety – exists. I'll call such worlds *genuine* worlds. Lewis (1973; 1986) is the main proponent of this view in the case of possible worlds; Yagisawa (1988; 2010) is its champion in the case of impossible (as well as possible) worlds.[9] An opposing *actualist* view holds that the non-actual worlds are mere *representations*, or models, of the ways our universe could or could not be.[10] There are many of varieties of ersatz world on offer to the theorist, depending on how she wants to represent ways the universe could or could not be.[11]

What marks a world as genuine or ersatz is how that world *represents*. A genuine world represents the existence of a flying hippo by having a flying hippo as a part.[12] Ersatz worlds, by contrast, represent the existence of a flying hippo by picturing, or linguistically describing, a flying hippo. As a consequence, Lewisian genuine worlds obey the *exportation principle*: if world w represents something as being an F, then something is an F. For if a genuine world w represents something

9. See Jago 2012c for the case against Yagisawa's account of impossible worlds.
10. Genuine worlds are also representations of ways things could or could not be, but they are not *mere* representations. They do not represent in a pictorial or linguistic way, as ersatz words do.
11. A third alternative, taking a cue from Bolzano (1834) and Meinong (1904), is to accept that there are worlds other than our own but deny that such worlds *exist* (Priest 2005). But there remains the question of the nature of such worlds. If they are genuine worlds, and genuine worlds are the best theoretical tool for the job, then I'd prefer to say that such entities exist.
12. More precisely, genuine worlds represent *de dicto* that A by being such that A. But they may represent *de re* of x that Ax by being such that, of some counterpart y of x, Ay (Lewis 1968; 1986).

as being F, then w contains an F as a part. And as w is part of the totality of being, that particular F too is part of the totality of being: so something is an F.

The exportation principle is problematic for any account of impossible genuine worlds, as Lewis (1986) notes. Exporting merely possible entities (or states of affairs) from genuine possible worlds lumbers us with a large and counterintuitive but still consistent ontology. Exporting impossible entities (or states of affairs) from genuine impossible worlds, by contrast, drags us into contradiction. If there is an impossible genuine world according to which there is a round square, then (given exportation) there is a real entity which is both round and square. But it is a necessary truth that no square is round, and so our exported round entity is also not round: contradiction![13] So one cannot accept impossible genuine worlds on the Lewisian model.

To avoid the exportation worry, must deny the move from 'according to w, Ax' to 'something is such that Ax'. One way to do this (for genuine worlds) is to insist that all property possession is world-relative: x may be F-at-w but not F-at-w' (much as I am happy on Sunday but not on Monday), with nothing being F *simpliciter*. McDaniel (2004) defends a view along these lines. These *overlapping* genuine worlds are just as unsuitable for providing impossible worlds as Lewis's worlds, although for a different reason. Take the case of Richard Sylvan, the New Zealand logician, born Richard Routley. It is impossible for Sylvan to be other then Routley, and hence there is an impossible world w at which Sylvan is not identical to Routley. On the view under consideration, that is to say that Sylvan bears the *non-identical-to-Routley* relation to world w. But Routley does not bear the *non-identical-to-Routley* relation to world w and hence, by Leibniz's law, Sylvan and Routley are not identical.[14] But this is absurd: Routley *is* (or *was*) Sylvan! Consequently, genuine worlds (whether overlapping or Lewisian) are not a suitable treatment of impossible worlds.

Ersatz worlds have a clear advantage over genuine worlds when it comes to impossibilities, for they do not require anything to *be* impossible, or possess impossible properties (either *simpliciter* or at-a-world). They are *mere* representations, and mere representations of impossibility are commonplace. (Just look at an Escher drawing, or read the Bible.) Given that we want very fine-grained impossible worlds (to make sense of the content of epistemic and doxastic states), the linguistic approach is the way to go. Impossibilities may be incomplete as well as inconsistent, and linguistic representation accounts for incompleteness far better than pictorial representation does. So I will focus on the linguistic approach to constructing ersatz worlds.[15]

13. The problem also affects the Bolzano-Meinong approach to impossible worlds. If such worlds are genuine (albeit non-existent) parts of reality, we can infer that reality itself has contradictory parts, described truly by some contradiction.

14. More formally: there is an impossible world w such that s bears $\lambda x x \neq r$ to w but r does not bear $\lambda x x \neq r$ to w:

$$[\lambda y R(y, \lambda x x \neq r, w)]s \wedge \neg[\lambda y R(y, \lambda x x \neq r, w)]r$$

which entails $r \neq s$.

15. Linguistic ersatz proposals were put forward, in different ways and for different purposes, by Carnap (1947) and Hintikka (1962; 1969). The approach has been defended more recently by Melia

On the linguistic approach, ersatz worlds are sets of sentences in some 'worldmaking' language. It must be clear how this language is to be interpreted. The simplest approach is to use a *Lagadonian* language, in which we take particulars to be names and properties and relations to be predicates, each interpreted to refer to itself (Carnap 1947; Lewis 1986). Atomic sentences are sequences of an n-place predicate (that is, a property or relation) followed by n terms (particulars). Designated set-theoretic constructions will serve as connectives, quantifiers and variables. We allow quantifier-prefixes to be infinitely long and conjunction and disjunction symbols to operate on (possibly infinite) sets of sentences. In this way, we avoid the *cardinality objection* from Lewis (1973, 90) and Bricker (1987, 340–3).[16]

This language must represent distinct (possible or impossible) situations without conflation. This requirement is much harder to meet, for there is 'an apparently devastating problem', the 'problem of descriptive power', for linguistic ersatzism (Sider 2002, 281). The problem is to represent possible but non-actual particulars, properties and relations *without conflation*. Since (by actualist assumptions) such entities do not exist, they cannot be invoked as names for themselves. So, it seems, we cannot represent such mere possibilities by *naming* them. The problem is indeed hard, and there is no space to assess it properly here; I set out my solution in detail elsewhere (Jago 2012a).

4 The Granularity of Worlds

Worlds are sets of sentence (of the worldmaking language). But *which* sets of sentences count as worlds? For Cresswell (1973), impossible worlds are worlds governed by some non-classical (e.g., intuitionistic or paraconsistent) logic. For other authors, they are worlds which represent some contradiction '$A \wedge \neg A$' as being true (Lycan 1994; Berto 2010). Combining these ideas, it is natural to think of impossible worlds as corresponding to the relational models of paraconsistent logic (see, e.g., Priest 1987). On this view, worlds are maximal and closed under paraconsistent consequence: if $\Gamma \subseteq w$ and Γ paraconsistently entails 'A', then 'A' $\in w$ too.

This is not a good move. Paraconsistent logic invalidates *modus ponens* and *disjunctive syllogism*. So the present approach will treat those inferences as being potentially informative. Yet the standard conjunction rules and *disjunction introduction* remain paraconsistently valid and hence can never be informative, on the present approach. Why think that *modus ponens* is informative, if *conjunction elimination* is not? After all, *modus ponens* is just as integral to the meaning of '$\rightarrow$' as *conjunction elimination* is to the meaning of '$\wedge$', and so there is just no reason

(2001) and Sider (2002).

16. The objection, in short, is that there are more possibilities (at least $\beth_2$) than sets of sentences (at most $\beth_1$), and hence sets of sentences cannot represent *all* the possibilities without conflation. But the objection assumes a countable worldmaking language, and so it is ineffective against the above proposal.

for declaring the former but not the latter to be informative.[17]

There is another, deeper problem with the selected worlds approach: it fails to explain why the worlds it provides are suitable tools for analysing epistemic notions. An epistemically accessible world is one which *looks* possible to the agent in question. But a world that is *trivially* impossible won't look possible to a minimally rational agent. On the present approach, worlds may represent explicitly contradictory situations $A \wedge \neg A$. Such situations are trivially impossible, and hence such worlds should never be considered epistemically possible, for any rational agent. If we remove such worlds from the account, however, we are left only with classical possible worlds, and the problems of logical omniscience return.

The approach I favour treats *any* set of worldmaking sentences as a world (Priest 2005), such that w represents that A iff there is a worldmaking sentence $S \in w$ which represents that A. Consequently, many worlds are *incomplete*, in the sense that (for some 'A') they represent neither that A nor that $\neg A$. A world is *prime* iff it contains a disjunct of each disjunction it contains. A world is *maximal* iff it contains either 'A' or its negation, for each sentence 'A' (of the worldmaking language). A world is *logically possible* (with respect to some logic) iff it is both maximal and consistent (with respect to that logic's derivability relation). Just when a world represents a *genuine metaphysical possibility* is a thorny issue, and one I do not propose to say anything about here. Ersatzers typically resort to primitive modal facts.[18] That's fine with me: my concern is not to give a reductive account of modal talk.

We can formulate a general argument in favour of this very liberal view of worlds. Suppose that knowledge is closed under the standard introduction and elimination rules for some connective C. This could be the case in general only because of the meaning of 'C' and the kind of mental state that knowledge is. Those rules stand to the meaning of C just as the standard introduction and elimination rules for other connectives C' stand to the meaning of C'. Hence knowledge must be closed under the standard introduction and elimination rules for C' too, for any standard connective C'. But these rules, taken together, are deductively complete and hence knowledge must be deductively closed. But knowledge is not deductively closed. By *reductio*, knowledge is not closed under the standard introduction and elimination rules for any (non-trivial) connective. Notice that this argument does not assume a worlds-based account of knowledge. It provides an independent reason for thinking it possible for an agent to know that A but not that B, for any distinct 'A' and 'B'. To capture this feature in a worlds-based account, we require worlds which are not closed under any inference rule (except *identity*, $A \vdash A$). In other words, we must count any set of worldmaking sentences

17. Note that the proponent of the selected worlds approach cannot respond by claiming that the meaning of '$\rightarrow$' is such that *modus ponens* is invalid. That would certainly provide a reason for not treating *modus ponens* and *conjunction elimination* on an informational par, but it would just as clearly hinder the task of explaining how *valid* inferences can be informative.

18. But, as Sider says, 'a reduction of talk of possibilia that employs primitive possibility and necessity is nevertheless valuable since talk of possibilia runs beyond what can be said in the language of quantified modal logic' (Sider 2002, 306).

as a world.

This very fine-grained notion of worlds (which, in my view, is mandatory for a suitable worlds-based account of content) does, however, invite worries about triviality. If *any* set of sentences counts as a world, then how can sets of worlds tell us anything about the *content* of a sentence? That, in essence, is the worry I address in the next section.

5 Is the Approach Trivial?

I will end by considering a general objection to the kind of approach I favour, but which might be raised against any semantic account which uses very fine-grained impossible worlds. The objection goes roughly as follows:[19]

> We want to assign a content to a sentence 'A'. We first try assigning a set of possible worlds, but we soon see that this is too coarse-grained. So we finesse the approach and assign a set of possible and impossible worlds to 'A'. These worlds are sets of sentences, and a world w is in the content of 'A' if and only if that world is a set containing 'A'. But then we come full circle: the 'content' assigned to 'A' is none other than 'A' itself, with a bit of set-theoretic machinery thrown in for good measure. Clearly, this 'content' can tell us nothing about the *meaning* of 'A'. We asked a question about the meaning of 'A' and what we get back by way of answer, more or less, is 'A' itself!

There are really two worries expressed here, one to do with defining content in terms of linguistic entities, and one to do with the granularity of contents thus assigned. These distinct worries might be expressed as follows.

Worry 1: A sentence 'A' is assigned a content, which is a set of worlds, which themselves are sets of sentences. So ultimately, the content of 'A' is given in terms of further sentences, much like a translation of 'A' into some other language. But a translation of 'A' can tell us what 'A' means (or what its content is) only if we have a prior grasp of the meanings (or content) of the sentences used to translate 'A'. Ultimately, we have to step beyond the linguistic realm of translations and assign meanings and contents *non-linguistically*, by correlating the sentence with the non-linguistic world.

Worry 2: A sentence 'A' is assigned a content, which is the set of worlds which represent that A. But these worlds are so fine-grained that the content thus assigned does not even include the content of '$A \vee B$', or of other trivial consequences of 'A'. So the *granularity* of contents is just the granularity of sentences. Each sentence of the language has its own unique content. So why not just let the content of 'A' be the singleton {'A'}? Of course, if we

19. I have heard objections of this form several times in discussion, although I have not seen it in print. It seems to me to be a genuine problem for *some* hyperintensional theories and so it is worth addressing here.

> did that, the theory would unquestionably *not* be an adequate account of content. But how is the present proposal any better?

Both worries, although rather vague, need to be taken seriously. A weak(ish) response to WORRY 1 goes as follows:

> We are interested in *modelling* the contents of sentences (and of epistemic and doxastic states, and of thoughts in general). We do this in terms of worlds. It really doesn't matter what those worlds *are*; all that matters is their formal properties. As in modal logic, it doesn't matter what we take the worlds to be. All that matters is the logics obtained by imposing various constraints on the semantics, and we can investigate all of this without being concerned one jot with the metaphysical nature of worlds.

It is indeed often a good idea to keep logical and metaphysical issues separate when investigating modal, intensional and hyperintensional concepts. But at some point, those with curious minds want to know, what *is* content? It is part of an answer to say that contents have such-and-such structure, but this is only part of the answer. Similarly, it is one thing to know that the natural numbers have an ω-structure, but that on its own does not tell us what numbers *are*.

What WORRY 1 misses, however, is that the account of content I suggested above *does* make contact with the non-linguistic world. Worlds are constructed from sets of worldmaking sentences, but those sentences are themselves constructed from worldly entities, in the Lagadonian way. The worldmaking sentence representing that Bertie is adorable contains Bertie himself and the property of *being adorable*. English sentences containing 'Bertie' are assigned a content which contains Bertie himself, in all his panting, muddy, tail-wagging glory (just as they are on the Russellian view of propositions).

WORRY 2 is more subtle. If the objection is that the account I've given assigns contents which are *too fine-grained*, then we need to hear more from the objector about what is the correct granularity to assign to contents. Suppose, for example, she says it is the coarse granularity provided by metaphysical or logical equivalence, or the granularity provided by the paraconsistent approach discussed in §4. But I argued above (§4) that such notions of content are always too coarse grained and so I take it that WORRY 2 should not be put in these terms.

Perhaps the genuine worry contained in WORRY 2 is that, on my view, a sentence '*A*' is assigned a content in terms of *itself*, or in terms of the singleton {'*A*'}, with some set-theoretic distractions thrown in. But this is clearly a misinterpretation of the proposal. '*A*' (a sentence of the object language, English, say) is not assigned a content in terms of '*A*' or {'*A*'}, but rather in terms of (sets of) Lagadonian *worldmaking* sentences. Hence it is not true that each *object language* sentence is assigned a content which ultimately consists of itself, plus some set-theoretic smoke and mirrors.[20]

20. Except in the case where the object language itself is the worldmaking language, of course. But why should we worry about that, given that the worldmaking language is fully interpreted in the Lagadonian way by letting each actual entity refer to itself?

The possible-and-impossible worlds account of content is not trivial. It succeeds in linking sentences to non-linguistic reality, as any account of content should. It provides a clear and simple account of when a content is true at a give world: content C is true according to world w iff $w \in C$.

One issue I have not touched on here is that, since every set of worldmaking sentences constitutes a world, there exist worlds which include explicit contradictions, '$A \wedge \neg A$'. Such worlds should not be considered epistemically accessible for any possible, minimally rational agent (§4). Nevertheless, as I argued in §4, such sets of worldmaking sentences need to be counted as worlds if we are to provide suitable contents for contradictory natural language sentences. They are worlds that are never epistemically accessible. The problem is to draw a distinction between trivially and non-trivially impossible worlds, and to allow only the latter to be epistemically accessible. This is a difficult task, to be sure. I discuss it in detail and present a solution elsewhere (Jago 2009a;b; 2012b).

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