

**SPREAD WORLDS, PLENITUDE
AND
MODAL REALISM:
A PROBLEM FOR DAVID LEWIS**

By

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1. Introduction: Modal Realism and Meta-Philosophy

David Lewis was famous (among other things) for the meta-philosophical claim that knock-down refutations are rare to non-existent in philosophy. You can argue that the costs of a theory exceed the intellectual benefits but it is difficult, if not impossible, to *prove* that it is false. When it comes to choosing between philosophical theories, it is generally a matter of ‘the price is right’, and when it comes to refuting a theory the best you can generally do is to drive up the costs whilst diminishing the benefits. There may come a time when the costs are so high and the benefits are so low that the theory can’t attract any takers, but this is usually due to a cumulative process of philosophical debate not to a sudden drop in net value brought about by a single decisive counterargument. When philosophers win, it’s nearly always a victory on points and almost never a knock-out. At the same time, Lewis subscribed to a philosophical thesis so outrageous as to cry out for knock-down refutation, namely that in order to make sense of modal truths, we must postulate an infinity of possible universes, all just as real as the one that we inhabit, but cut off from us in space and time. (This has the corollary that in order to make sense of causality we must postulate an infinity of items that have no causal connection to anything that happens in this universe.) Thus the temptation is to go for the double-whammy, the knock-down refutation of modal realism which is also a counterexample to the meta-philosophical claim. This was our aim when we first drafted this paper, but we can’t honestly claim the double victory that we originally hoped for. We may have given Lewis’s modal realism a drubbing but we don’t pretend to have decked it. Even if we have succeeded in driving up the costs of Lewis’s modal realism, it still retains enough benefits to attract some (rational) takers. Thus whatever the fate of Lewis’s *philosophical* thesis, the meta-philosophical claim remains intact.

We first wrote this article nearly twenty years ago when Lewis himself was very

much alive, but for one reason or another we never got around to publishing it. Rather than rewriting it to take account of the sad fact of his death we have decided to leave it in the present tense. We dedicate this paper not only to our friend and colleague, Colin Cheyne (who does not think we should believe in entities which cannot causally affect us), but to the memory of David Lewis, a great philosopher and a great teacher.

2. Modal Realism: Mad Dogs, Milkshops and Primitives

In his metaphysical summa of 1986, *The Plurality of Worlds*, (henceforward POW) David Lewis famously defends a doctrine he calls modal realism. The idea is that possible worlds are real, indeed *really* real. They are concrete entities just like our own world, but cut off from us in space and time. To every logically possible set-up there corresponds such a world. Lewis calls this the Principle of Plenitude. In fact, Lewis *identifies* his worlds with such set-ups - a move which makes it difficult to specify the Principle of Plenitude in a non-circular way (POW, pp. 86-92). Lycan (1988) calls this doctrine 'mad dog' modal realism' 'Rape-and-Loot modal realism' and even 'Nuclear Holocaust modal realism', This is in contrast to moderate, milkshop or, as Lewis describes it, *ersatz* modal realism. Ersatz realists believe in possible worlds all right. It is just that their possible worlds are less ontologically outrageous. Usually, they construct them out of actual entities of some kind: points, sets, sentences or what have you. This is 'paradise on the cheap', since we get all the theoretical advantages of possible worlds without the ontological drawbacks.

Lewis thinks he can do without modal primitives and that the milkshop defenders of ersatz worlds cannot. This he holds to be the drawcard of an otherwise unpalatable theory. His possible worlds are admittedly implausible things (especially in such abundance) and the chief reason for believing in them, rather than in ersatz possibilia of some kind, is that they enable us to eliminate modal primitives.

Although sometimes denounced as a Meinongian, indeed a relentless Meinongian (Lycan, 1979), Lewis is, in fact, a rather heterodox Quinean. His aim is to explicate the modal concepts in terms of first order logic plus an ontology of possibilia. He retains a Quinean *ideology*, that is, the conviction that the resources of first-order logic, quantifiers, predicates, truth-functional connectives and the possible assistance of truth and

satisfaction, are adequate to describe reality.¹ But unlike Quine (who prefers to believe there are no such things²) Lewis recognizes modal facts. To accommodate these facts within a Quinean ideology³, to *explain* the modalities in terms of quantification theory, Lewis has to invent *more* reality. The price of his ideological restraint is ontological inflation. He must posit an infinity of objects to quantify over. But it is important to realize that despite his ontological exuberance, what Lewis is putting forward is a *reductive* theory. It is just that the reductions are conceptual rather than ontological. The aim is to take the modality out of modality, to reduce modal to non-modal discourse even if the universe of discourse has to be inordinately expanded to do so. (It is for this reason that Plantinga (1987) denies Lewis his title to modal realism. For Plantinga, a modal realist must be a realist about *modality* and not just *possibilia*.) Moreover, in remaining true to the ideological constraints, Lewis has to ditch other aspects of the Quinean legacy. For Quine it is science that tells us What-There-Is. For Lewis that is true only of *this* world. Science tells us about that tiny portion of reality that is spatiotemporally related to *us*. As for the rest, a logically disciplined imagination is a better guide (POW, pp. 113-115).

The natural response to Lewis is a *tu quoque*. Milksop realists and plain modal sceptics have tried to pin Lewis down with modal primitives. They have tried to argue that he too implicitly relies on primitive notions of necessity and possibility. In which case his theory is no better than that of his milksop opponents, or indeed than the No-Theory Theory of Modality which simply assumes modal operators as primitives and leaves it at that. Indeed it is considerably worse off, since their ontologies are more believable. (See Lycan, 1988.) Our criticism is just such a riposte.

We shall argue that (on *one* reading) Lewis's Principle of Plenitude licenses us to assume maverick possible worlds which spread through logical space gobbling up all the

¹ Lewis's ideological allegiance to Quine is most nakedly displayed in the opening paragraphs of his (1968) 'Counterpart Theory and Quantified Modal Logic'. See also his POW pp. 1-20, and especially p. 4. However, in the nineties there was some degree of relaxation in Lewis's ideological austerity. He came to accept the plural quantification theory of George Boolos. See Lewis (1991) *Parts of Classes*, especially pp. 62-71. But by adding the apparatus of plural quantification to his ideology, Lewis ceases to be a heterodox Quinean and becomes something close to an apostate. (Boolos is very explicitly an opponent of Quine. See his (1985) pp. 331-334.) We are inclined to think that this undermines the philosophical rationale for modal realism. After all, if we are allowed the ideological indulgence of plural quantification given the rather minimal ontological savings it brings in, why not allow us the further indulgence of modal primitives given that the ontological savings would be massive?

² For an excellent survey of Quine's views on modality and some sharp criticisms along the lines suggested see Haack (1979) ch. 10.

³ See Quine (1961) p. 131.

rest. Because they exclude alternatives, these worlds undermine Plenitude itself, and worse still, result in contradictions, since different spread worlds are incompatible with one another. Plainly the Principle of Plenitude must be amended to exclude these excluders. But, we maintain, this cannot be done without bringing in modal primitives. And once we admit modal primitives, bang goes the rationale for Lewis's modal realism. We then consider various replies, the chief of which is due to Lewis himself. He insists that Plenitude does *not* license the spread worlds and hence that no amendment is needed. *A fortiori* no amendment is needed which requires him to make use of modal primitives. We answer that in that case his theory is disturbingly unspecific about which things are possible. Its intellectual value is therefore much diminished. Perhaps the price is no longer right.

3. The Principle of Plenitude: Some Preliminaries.

What is the Principle of Plenitude? It appears in two versions, a *naive* version (absolutely every way a world could possibly be is the way that some world is), and an *official* version which relies on the Principle of Recombination. The official version is required since the naive version is trivialized once Lewis identifies worlds with ways worlds could possibly be. Both the official and the naive versions of Plenitude look like attempts to improve on another principle which we shall refer to as ur-Plenitude. It goes like this: to every consistent set of sentences there corresponds (at least) one possible world. We conceive these sets of sentences as finite and as stated in some language such as English. (We are not, for instance, talking about infinite sets of sentences composed of letter shaped sets of points and inscribed in deep space.) For a set of sentences to be consistent it is not enough for it not to *include* any contradictions. It must not *entail* any contradictions either. Hence ur-Plenitude presupposes some concept of consequence. But logical consequence won't do by itself. For the set of sentences {Oscar is round; Oscar is square.} is *logically* consistent, since no contradiction can be derived from the pair with the aid of logic alone. But it does not represent a genuine possibility. Round squares (let alone round squares called 'Oscar') cannot be consistently supposed. The way to get around this is to specify that a set of sentences is consistent (in this sense) iff it does not entail any contradictions *once the relevant analytic truths or meaning-postulates are added in*. Since it is analytic that squares are not round, we can derive the consequence that Oscar is round and not round from the offending sentence set. Since this is a contradiction, the set does not qualify as consistent under the amended definition.

We suspect that Lewis would find ur-Plenitude sympathetic. Other things being

equal (perhaps an important qualification!), he would like to derive ur-Plenitude as a consequence of his theory. Indeed, ur-Plenitude (or something like it) is probably among the intuitions that his theory is tailored to fit. (See POW, p. 154, where the role of such intuitions is discussed.) But ur-Plenitude cannot figure among the constitutive principles of his system. This is partly because it is vague and partly because it presupposes, or seems to presuppose, modal notions. And these must be banished from the foundations of a reductive theory. Ur-Plenitude is *vague* because it relies on the notion of analyticity and the borders of the analytic are notoriously unclear. And it *presupposes modal notions* because *analyticity*, like *consequence*, is difficult to define without recourse to necessity. In the case of consequence the difficulties can perhaps be overcome. Consequence can be defined in model-theoretic terms if we help ourselves to set theory. And the concept of a contradiction poses no particular problems since it can be defined without recourse to modalities. Thus it is analyticity that poses the real problem. This concept is notoriously difficult to elucidate without bringing in necessity. And even a heterodox Quinean like Lewis would hesitate to employ it as a primitive.⁴

Now, as van Inwagen has pointed out, Plenitude in its naive form turns out to be trivial once we identify worlds with ways that worlds could be. If worlds *are* logical possibilities then by definition there would be a world corresponding to each possibility even if there were only seventeen worlds or none at all. (POW, pp. 86-87.) This means (among other things) that we cannot derive ur-Plenitude from naive Plenitude. For if there were just seventeen worlds, naive Plenitude would be true and ur-Plenitude false. After all, there are more consistent sets of sentences than seventeen (and more than seventeen sets of such sentences that are *both* incompatible with actuality *and* with each other).

To rescue his theory from triviality, Lewis is compelled to develop a more sophisticated version of the Principle of Plenitude. He does this with the aid of *worlds*, *duplicates* and a Principle of Recombination. Miller (1989) p. 477, extracts the following definition of a world from Lewis.

- (1) Individuals are worldmates if they are spatio-temporally related.

⁴Lewis does not discuss ur-Plenitude explicitly. But his arguments against linguistic ersatzism, suggest that he would reject it as a fundamental principle for the reasons we have alleged. (The same goes for the principle of Consistent Describability discussed below.)

- (2) A world is a mereological sum of worldmates.⁵

Now we know *what* worlds are (or at least, what they are supposed to be), the next question is: *which* worlds are there? Part of Lewis's answer is to list some of the weird and wonderful possibilities he thinks are realized somewhere in logical space. This gives the reader some idea of the range of variations permitted by Plenitude. But his more careful answer relies on duplicates and the Principle of Recombination. Duplicates are physically identical copies of things. They must also not be worldmates of the original thing. The Principle of Recombination says that duplicates of anything can coexist, or fail to coexist, with duplicates of anything else (POW, pp. 88-89). So if there is one world with a talking donkey, and another world with a tap-dancing owl, then there is a third world in which a talking donkey and a tap-dancing owl are playing Canasta. Again, if there is one world with a talking head attached to a human body then there is another world in which the head is just as voluble but detached. (It must be rather alarming for the inhabitants of that world, especially if there is only one detached talking head!) It is evidently Lewis's belief that Recombination will underwrite the enormous variety of worlds suggested (though not implied) by the more naive version of Plenitude. By the same token, Recombination should guarantee the truth of ur-Plenitude. Indeed it *ought* to do so, if, as we suspect, Plenitude is an attempt to generalize the idea behind ur-Plenitude, by transcending the limitations imposed by language.

But there is a problem with Recombination. As Denis Robinson put it in conversation, it is something of a sausage machine. Once you have a set of worlds, you can generate new ones by recombining duplicates of their components. Or rather, since the 'new' worlds are supposed to be there already, given a set of worlds, you are entitled to *assume* the existence of other worlds composed of duplicates of their components. (Recombination, despite some loose talk, is an *epistemic* not a *metaphysical* principle, a license to posit, not a license to construct.) But which worlds and which entities are you entitled to posit in the first place? An obvious answer would be worlds composed of duplicates of actual entities⁶. This is quite a generous license. It allows us to assume

⁵This definition did not take a lot of extracting. On page 71 Lewis states that 'things are worldmates iff they are spatiotemporally related', and on page 69 that 'a world is the mereological sum of all the possible individuals that are parts of it, and so are worldmates of one another'.

⁶David Armstrong proposes something similar in *A Combinatorial Theory of Possibility*, (1989). However, Armstrong's combinatorial worlds are ways actual objects could be, not ways that their duplicates are.

anything that can be made up out of whatever the fundamental particles of this universe turn out to be. (At present, we understand the smart money is on quarks, gluons and leptons.) And we take it that an enormous variety of non-actual entities could be constructed out of these (or to be precise, their duplicates). But the license is not generous enough. For Lewis is inclined to believe in the possibility of *alien* entities, things possessed of properties not exemplified by anything in this world and not composed (or not wholly composed) of entities exemplifying this-worldly properties. Although an atheist with respect to the actual, he believes that God is possible even though a God could not be manufactured out of duplicates of actually existing things. (God is alleged to be simple and not composed of parts of any kind, let alone parts which are duplicates of actual items.)

But if we can assume alien individuals before applying Recombination, what are the constraints on postulating worlds and individuals to duplicate? Part of the answer is supplied in Lewis's section on 'Isolation' (POW, pp. 69-81). Only spatial or temporal beings can qualify, although Lewis is fairly relaxed about non-standard times, spaces and space-times. But another answer is suggested in Lewis's reply to Forrest. 'If, as I suppose, a being does not have to satisfy some inconsistent description to be a god, then I take the number of Gods to be at least 2^∞ .' (Lewis, 1983, p. xi n4.) If a god does not have to satisfy an inconsistent description in order to be, then somewhere or other He She or It exists. (This does not mean that in logical space someone can always hear your prayers, let alone your screams, for the Gods of other worlds are deaf to us. Lewis's polytheism is not of a very comforting kind!) The same, we presume, goes for other aliens, from dragons and devils down to talking donkeys and Democritean atoms. If a being does not have to satisfy an inconsistent description to exist, then somewhere in logical space there is such a being. If you've got Consistent Describability then you have got what it takes to be. What might be called the principle of Consistent Describability entails but is not entailed by ur-Plenitude. Ur-Plenitude says that there is at least one world corresponding to every consistent description. The Consistent Describability principle says there is at least one world corresponding to every *possible* consistent description. Plainly the second entails the first since *actual* consistent descriptions are a mere subset of the possible. But there is a problem with Consistent Describability. Lewis no doubt believes that there are *more* things than *we* can consistently describe (where the 'we' is restricted to the inhabitants of

actuality), since some alien entities possess properties which we have not even imagined. What we have not imagined we have passed over in silence, neglecting to invent the appropriate predicates. And in the circumstances, this act of neglect will be difficult to remedy. (There are more things in logical space Horatio than we will *ever* dream of in our philosophies. See POW p. 159.) But Consistent Describability cannot be *added* to Plenitude as an extra clause telling us which alien worlds and entities it is right to posit. The reasons have been touched on already when we discussed ur-Plenitude. If Consistent Describability were properly spelt out it would almost certainly employ a modal primitive. This is not to say that Consistent Describability should not come out *true* according to Lewis's system. Indeed, it might be employed as a sort of a *gloss* to elucidate Plenitude and to give people an idea of which alien entities can be safely assumed. But as *primitive* principles or as *axioms* of Lewis's system both ur-Plenitude and Consistent Describability are out of the running. The closest Lewis can come is the insistence that there are no contradictory worlds, no worlds of which sentences of the form 'P and not-P' are true. For according to Lewis, you cannot tell the truth about *anything* - not magic mountains far away, nor individuals in another space-time - by contradicting yourself. (See POW, p. 7n and Lewis .1983, p. 21.)

What is the upshot? We have discussed the following principles:

- 1) ur-Plenitude: to every consistent set of sentences there corresponds at least one world;
- and
- 2) Consistent Describability: to every *possible* consistent set of sentences there corresponds at least one world.

Both are intuitively plausible. But neither can be admitted as axioms within Lewis's reductive theory. Yet without them Lewis's principle of Plenitude in its official version seems curiously incomplete. We are allowed to assume *some* alien entities before applying the principle of Recombination, but apart from the proviso that we should not assume

worlds or entities of which contradictions are, or would be, true, we don't have much guidance as to which entities are available for duplication. However, we have argued that (pending strong counterarguments) 2) and 1), *ought* to come out true, according to Lewis's theory, and some of Lewis's remarks suggest an explicit commitment to 2). Plenitude should be interpreted in such a way as to underwrite the existence of worlds corresponding to consistent descriptions. There should be at least as many worlds as we can consistently suppose.

4. David Lewis Meets Martin Luther

But Plenitude so interpreted is false. There are some worlds which are *consistent* but *impossible*, or less tendentiously, some sets of sentences which are logically consistent, indeed consistent in the stricter sense we have been trying to elucidate, but which *must not* be allowed to describe existent possible worlds. For if these worlds are admitted as genuine then they induce modal collapse. That is, they reduce the plenitude of worlds to one.

One such world is the *Lutherworld*. This is the world in which Luther's theology is true (See Luther (1525) (1957) *Of the Bondage of the Will*). In that world the following propositions hold:

(i) God exists.

(ii) God foreknows and wills all things, not contingently, but necessarily and immutably. (Luther (1957) pp. 83-4).

What (ii) amounts to is: for any proposition p , if it is true then God knows it necessarily. In symbols: $(p)(p \supset \Box GKp)$.

In the Lutherworld all true propositions are necessary. So if Luther's God is possible (in the modal realist sense), then God exists and everything God foreknows will necessarily come to pass. Here is how it works. It is a truism indeed a necessary truth about knowledge that for any (person) x , if x knows that p , then p . In symbols:

$$\Box(x) (xKp \supset p)$$

From which it follows that necessarily if God knows that p , then p , i.e:

$$\Box(GKp \supset p).$$

The following is a theorem of all modal logics from K on up (indeed, it is often used as an axiom): $\Box(p \supset q) \supset (\Box p \supset \Box q)$. By substituting in we get: $\Box(GKp \supset p) \supset (\Box GKp \supset \Box p)$. Now consider any truth p . From thesis (i) of Luther's theology, it follows that necessarily God knows that p , i.e. $\Box GKp$. Then from a truism about knowledge plus an uncontroversial modal axiom it follows by 'resistless logic' (Luther's phrase) that $\Box p$, that is that p is necessary. Since all truths are known to God and in Luther's world necessarily known, it follows that all truths are necessary, indeed *logically* necessary, necessary in the strongest sense of the word. So far, you may say, all that has been shown is that *in the Lutherworld*, all true propositions are necessary. That does not prove that they are necessary in *this* possible world. And you would be right but for the S_5 principle (accepted by Lewis) that if possibly necessarily p , then necessarily p (or $\Diamond\Box p \supset \Box p$). What this means is that if a proposition p is necessary in the Lutherworld, it is necessary in *all* possible worlds including this one. Contingency therefore is abolished and there is only one way the world could be, namely the godly and predetermined way that it is.⁷ Given Lewis's analysis of modal concepts this means that there is only one possible world, the actual one, and it is the Lutherworld. (Or alternatively there are *lots* of identical worlds and that *all* are Lutherworlds.) We call worlds like the Lutherworld '*spread worlds*' or '*excluder worlds*' since once they are admitted as possible, they spread through logical space and exclude all alternatives.

5. Thick Spread Worlds, Thin Spread Worlds and an Ontological Argument

However, we distinguish between *thick* spread or *highly* exclusive worlds, which eliminate all worlds but one (such as the Lutherworld), and *thin* spread or *moderately* exclusive worlds which merely eliminate worlds which lack certain characteristics. The Lutherworld is a *thick* spread world since it excludes all worlds except the one that God foreknows. Plantinga's world by contrast, the one he assumes for the sake of the ontological argument, is a *thin* spread world, since if it is admitted, it only excludes worlds without God.

⁷ For more on Martin Luther and his repellent opinions see Pigden (1989) pp. 141-2, and Pigden (1990) §2.

In his famous (or perhaps infamous) proof, Plantinga proposes a possible world in which unsurpassable greatness is exemplified. (Plantinga (1974) p. 216.) Unsurpassable greatness amounts to having maximal excellence in every possible world, and maximal excellence amounts to being God-like. This allows us to reformulate his argument as follows.

(i) Possibly there exists a being which is necessarily God-like. In symbols:

$$\Diamond(\exists x)(\Box Gx).$$

(ii) Necessarily there exists a being which is necessarily God-like, if and only if necessarily there exists a being which is God-like. More perspicuously:

$$\Box((\exists x)(\Box Gx) \equiv \Box(\exists x)(Gx)).$$

The second thesis (ii) is crucial to Plantinga's proof. In fact it is one half of the necessary biconditional, (ii') $\Box((\exists x)(\Box Gx) \supset \Box(\exists x)(Gx))$, that does all the work.⁸ The trick behind Plantinga's proof (as many people have realized)⁹ is to exploit the S₅ maxim:

$$\Diamond\Box p \supset \Box p.$$

Crudely put, the idea is to move from 'Possibly necessarily God exists', to 'Necessarily God exists' - in which case He is actual. But that is a little *too* crude. Plantinga's initial premise (i) is not that 'Possibly necessarily there exists something which is God-like' (in symbols: $\Diamond\Box(\exists x)(Gx)$) but 'Possibly there exists something which is necessarily God-like' (in symbols: $\Diamond(\exists x)(\Box Gx)$). This premise by itself does not allow him to work the old

⁸ What is the other half of the biconditional, (ii'') $\Box(\Box(\exists x)(Gx) \supset (\exists x)(\Box Gx))$, supposed to do? Why does Plantinga need this? Perhaps to ensure that it is the same entity that is God-like in every possible world. If different beings possessed the God-like properties in different possible worlds, none of them would be truly God. So Plantinga must establish not only that a God-like being exists in every possible world, but that the God-like being is *God-like* in every possible world. It would not do, for instance, if the 'God' of this world were the 'Satan' of another and vice versa. This is not a problem for Lewis. If he were willing to accept Plantinga's premises (which, of course, he is not) it would follow automatically that the 'God' of this world (or better the God-like being) was 'identical with' the 'Gods' in all the other worlds in the rather attenuated sense that it would be a counterpart of all the others. (At least it would follow on the assumption that you can have at most one 'God' per world.) And that is all the trans-world identity there is. Lewis would agree with Plantinga that being a counterpart of x is not really being identical with x , but would try to fob him off with the assurance that there is nothing more to be had.

⁹ See for example Mackie (1982) pp. 55-63.

S_5 magic, since there is a quantifier standing between the ' \diamond ' and the ' \square '. These operators must be brought together if $\diamond\square p \supset \square p$ is to do its stuff. What (ii') does is to allow Plantinga to hop the modal operator over the quantifier, so that the ' \diamond ' and the ' \square ' are adjacent. In other words, it allows him to derive

$$(iii) \diamond\square(\exists x)(Gx).$$

From then on (in S_5) it is all plain sailing. The reason Plantinga requires an extra premise to do this is because he rejects the Barcan formula $\square((\exists x)(\square\varphi x) \supset \square(\exists x)(\varphi x))$ (as does David Lewis¹⁰). Indeed, any philosopher who supposes that there might be more or less things than there are, *must* reject this principle. The fact that a world contains something which is necessarily φ (i.e. φ in all the worlds in which it exists) does not entail that necessarily there is something which is φ . For the thing which is φ might not exist or might not have a counterpart in other possible worlds. So Plantinga needs (ii') to vindicate in particular the thesis that he rejects in general: Necessarily if there is something which is necessarily God-like then necessarily there is something which is God-like.

Now the interesting thing is that Plantinga does not need such a strong set of premises to achieve his result. All he needs to do is to strip the initial operators from (i) and (ii'), yielding

$$(ia) (\exists x)(\square Gx)$$

and

$$(ii'a) (\exists x)(\square Gx) \supset \square(\exists x)(Gx)$$

and to conjoin these behind one possibility operator. This produces the thesis

$$(i-ii') \diamond((\exists x)(\square Gx) \ \& \ ((\exists y)(\square Gy) \supset \square(\exists y)(Gy)))$$

(Possibly there exists something which is necessarily God-like, and if there exists something which is necessarily God-like then necessarily there exists something which is God-like.)

¹⁰ Lewis (1968)(1983) p. 36

This entails (iii), and with (iii) and S_5 , we can spread God-like beings throughout logical space. But Lewis's system of possible worlds (like Plantinga's) is designed to underwrite S_5 . Lewis therefore must deny (i-ii') since if it were true, there would be no world without a duplicate of God. And this is inconsistent with the Principle of Plenitude which states that the duplicates of anything can coexist or fail to coexist with the duplicates of anything else. This means that we can specify a world, the Plantingaworld, which is, or seems to be, consistent, but which Lewis must prohibit as impossible. It is the world (or set of worlds) described by the following sentences:

$$(ia) \quad (\exists x)(\Box Gx)$$

(There exists something which is necessarily God-like.)

and

$$(ii'a) \quad (\exists x)(\Box Gx) \supset \Box(\exists x)(Gx)$$

(If there exists something which is necessarily God-like then necessarily there exists something which is God-like.)

The Plantingaworld is a *thin* spread or moderately exclusive world. Unlike the Lutherworld which excludes *all* alternatives, the Plantingaworld only excludes the Godless ones. There are less worlds than Lewis supposes but still more than one. So far as Plantinga is concerned, possible worlds can be as they please, so long as they include God (and all that that entails). *Thick* spread worlds therefore exclude Plurality; *thin* spread worlds merely exclude Plenitude. Both are inimical to Lewis.

6. Is God the Problem?

Although we have chosen a pair of godly examples, it should be obvious that God is not really the logical culprit here. Or if He is there are other alleged possibilia that are equally at fault. For we can specify spread or excluder worlds without bringing in God at all. The Plantingaworld provides a sort of schema which allows us to manufacture excluder worlds at will. We simply substitute for 'G' in (ia) and (ii'a) any predicate we like, and straightaway we have a world (or a world-description) which will spread that predicate throughout logical space (at least it will do so if the world in question is admitted as real). If the 'G' stands for 'G-string' there are no worlds without G-strings, if the 'G' stands for gumnut there are no worlds without gumnuts etc. etc. etc.. Nor does Plantinga provide the only set of sentences that can be used to perform this trick. The Lutherworld suggests

otherwise, and we are sure that ingenious logicians could invent many more. And there is another point to note. Although excluder worlds seem to be internally consistent in the broad sense we have defined, they need not be compossible, that is, compatible with other excluder worlds. There are worlds or world-descriptions such that if either is admitted as possible, the other is automatically excluded. For instance, we can specify *atheistic* excluder worlds; worlds which once admitted as real, rule out a genuinely Divine Being. Again Plantinga shows us how¹¹. He is discussing properties rather than worlds, but his argument can easily be adapted to our needs. Consider the world described by the following sentences :

$$(iv) \quad (\exists x)(\Box \sim (\exists y)(Gy))$$

(There exists something such that necessarily there is no God-like being.)

and

$$(v) \quad (\exists x)(\Box \sim (\exists y)(Gy)) \supset \Box ((\exists x)(\sim (\exists y)(Gy)))$$

(If there exists something such that necessarily there is no God, then necessarily there exists something such that there is no God.)

Call this the Shelleyworld (named for Shelley's pamphlet *The Necessity of Atheism*). This spreads godlessness throughout logical space excluding theistic alternatives. It is thus a thin spread world, but one which is not compossible with either the Plantingaworld or the Lutherworld. Indeed, Lewis himself believes in a world (in his view the actual one) which is at least *mildly* exclusive since it rules out both the Plantingaworld and the Shelleyworld. For Lewis believes that the following sentence is actually true. (Lewis (1983) p.ix.):

$$(vi) \quad \sim (\exists x)(Gx) \ \& \ \Diamond (\exists x)(Gx)$$

(It is not the case that there exists a which is God-like and possibly there exists a being which is God-like.)

But if God is not actual the Plantinga world is impossible and if God is possible then the Shelleyworld is not. This shows us that excluder worlds can be mutually exclusive. So some ban on the promiscuous positing of such worlds is needed, not just to save Plenitude or even Plurality, but to save us from contradiction. We can also see *why* excluder worlds are dangerous, indeed, why it is that they are so exclusive. It is not because the sentences

¹¹ Plantinga (1974) pp. 218-20.

that describe them deal in the Divine, but because they deal in modalities, especially necessities, that excluder worlds spread through logical space edging out their rivals.

6. The Problem with Plenitude.

‘But what *is* the problem exactly?’ someone might demand. ‘Excluder worlds are incompatible with Plenitude and with each other. Plenitude is true. So there are no such worlds. End of story.’

Imagine a naive set theorist - call him Georg - who accepts Russell’s paradox as an elegant proof that there is no class of classes that are not members of themselves but thinks he can leave it at that. Such a response would miss the point. For the existence of the paradoxical class follows from the abstraction axiom which is central to naive set theory. Russell’s paradox proves that the abstraction axiom is false and has to be amended. Georg cannot simply dismiss the Russell class and relapse into his dogmatic slumbers - not if he wants to have a consistent theory that is. For much the same reasons, it is not open to Lewis to shrug off our results as a reductio of the existence of certain worlds. It is true that the existence of spread worlds is incompatible with Plenitude. But Plenitude *itself* seems to license such worlds. And if Plenitude implies the existence of worlds which are incompatible with Plenitude, then Plenitude is false and will have to be amended. So the real question is: does Plenitude really entail the existence of spread worlds?

7. Revenge of the Modal Primitive from Logical Space.

Suppose that it does. Then Lewis must restrict Plenitude so as to exclude excluder worlds. *And he must do this without recourse to modal primitives.* (Otherwise modal realism loses out to its ersatzist competitors in the philosophical price war.) We think this will be very hard to do. The problem is that excluder worlds are consistent but impossible (or as Lewis would have to say in his official theory, consistent but *nonexistent*). So Lewis must define what it is about excluder worlds which makes them dangerous and must add to the Principle of Plenitude the proviso that there are no sums of worldmates like *that*. The obvious way to do it is to deny that there are any worlds corresponding to world-descriptions which entail non-logical, *de dicto* necessities (i.e. box-prefixed sentences which are not logical truths). But apart from the fact that this restriction appeals to the notions of *necessity* and *logical truth*, and probably *logical consequence* and *analyticity* as well, Lewis *wants* some necessary but non-logical sentences to be true at his worlds, namely those which are analytic and those which express the findings of pure mathematics. (Given the ontological commitments of mathematics mathematical truths do not qualify as analytic

i.e. true in virtue of logic plus definitions.) Nor would it do to roundly assert that there are no non-logical, *non-analytic*, *non-mathematical*, de dicto necessities, and that therefore excluder worlds are consistent but impossible (Oops sorry! *nonexistent*). For such a proviso obviously relies on several notions it would be difficult to define without recourse to modal primitives, analyticity being the chief.

(This suggests an important difference between ontological and conceptual reductions. If it is ontological reduction that we have in mind then there is no problem about mentioning the items to be reduced. These can figure within the reducing theory which can simply assert that there are no such things or that they are non-basic and are made up out of other things. It is otherwise with conceptual reduction. Of course, the total theory must include translation schemata whereby statements involving the suspect concepts are paraphrased into a dialect which makes no mention of them. But the reducing theory itself must not employ the concepts to be reduced. And you are *using* a concept even when you are *denying* sentences which themselves employ that concept. In the present case Lewis would not succeed in his conceptual reduction if he were forced to say that there are *no* worlds or individuals which entail certain kinds of necessities. Plenitude is supposed to be part of the reducing theory and so should be storable in a language that does not employ modal notions, even in the context of sentences or subsentences which are negated. Conceptual reduction therefore is a ticklish business, in some respects rather more difficult than ontological reduction. In the official reducing theory you can't even talk about what you are trying to do away with.)

Suppose on the other hand that Plenitude does not entail the existence of excluder worlds. Plenitude is not to be read in such a way as to underwrite the Principles of ur-Plenitude and Consistent Describability. Hence it is not (or not provably) inconsistent. We are allowed to posit alien entities subject to the constraints of consistency and to some other constraints which are not specified. These (we must suppose) do not entail the existence of thick or thin spread worlds. Then Lewis's system would escape contradiction and the need to posit modal primitives - but only at a cost.

8. Plenitude and the Spread Worlds.

David Lewis discussed this argument with us on a number of occasions both orally and in writing. And several other philosophers have been kind enough to furnish us with comments. In this section we shall attempt to deal with Lewis's response. We shall refer other criticisms as we go along.

As we understand it, Lewis's position is this. The Principle of Plenitude does not entail the existence of spread worlds. But Plenitude is true. Thus the fact that spread worlds are incompatible with Plenitude is simply a proof that there are no such worlds. If there is a Lutherworld 'then there isn't also a world in which God foreknows differently, let alone a Godless one - but there are such worlds, ergo there's no Lutheran world.' We have, in effect, performed a *reductio* on both ur-Plenitude and the principle of Consistent Describability. It turns out to be false that there is a world corresponding to every consistent set of sentences. Hence it is false that there is a world corresponding to every *possible* consistent set. But Plenitude does not imply either of these false principles and never has. Indeed, in an early article 'Anselm and Actuality'¹² Lewis discusses a variant of Plenitude which comes close to the one we have tried to saddle him with. He calls this *the Principle of Saturation*, and dismisses it precisely because it leads to contradictions of the kind we have suggested. (Lewis, 1970, pp 182-183, 1983, p. 16.¹³) So there is no need to add a 'new wrinkle' to the Principle of Plenitude to exclude the spread worlds. A fortiori, there is no need for a 'new wrinkle' which employs a modal primitive (Lewis 1989, 1990).

Well, does Plenitude entail the existence of spread worlds or doesn't it? There are three (not two!) options.

A. The Principle of Plenitude is clear and the existence of spread worlds does indeed follow. We win, Lewis loses. He must add a new wrinkle, and this will be hard to do without recourse to modal primitives.

B. The Principle of Plenitude is *not* clear. Hence it is not clear whether it entails the spread worlds or not. In which case we have struck Lewis a glancing blow. For it turns out that his theory is (to use his own terminology) a magical one. You have a bit of philosophical machinery (Plenitude) which is supposed to do a job (generate roughly the same range of worlds that we would be naively inclined to postulate). But it is not clear how this bit of machinery is supposed to work or whether it does its job. Furthermore, Plenitude remains at risk. It may be that when it is spruced up and clarified it *either* implies the existence of spread worlds *or* employs a modal primitive.

¹² Originally published (1970).

¹³ We had not noticed this passage until Lewis pointed it out to us. If our article performs no other function it will enable readers to make sense of Lewis's rather compressed remarks on this topic.

C. The Principle of Plenitude *is* clear and *does not* entail the spread worlds. We lose and Lewis wins. Even so, the victory may be Pyrrhic. Perhaps Plenitude turns out not to be so attractive once we understand it properly. Perhaps it is covertly reliant on a modal primitive in the first place.

Obviously Lewis must go for option C with the proviso that there is nothing Pyrrhic about his polemical victory. We must go for option A, with B and a Pyrrhic C as fallback positions.

Is Plenitude clear? Not really. As we have seen, it is curiously incomplete. We are entitled to postulate *some* alien individuals. And once we have got them we can combine or fail to combine them at will. But apart from this, Lewis gives us very little guidance. There are no constraints on our freedom to postulate apart from consistency. We must not assume any entity of which contradictions would be true. But neither is there a *license* to postulate. Lewis does not say that we can postulate anything we like so long as it is consistent - not when he is being careful that is. The official theory is officially silent on this point. To get an answer we must seek an informal gloss on this official formulations. Now in his (1983) p. xi, Lewis *does* say that so long as a God does not have to satisfy an inconsistent description to be then Gods exist in very large numbers. Which suggests we can assume anything which does not have to satisfy an inconsistent description. Taking Lewis at his word, we were able to postulate our paradoxical worlds. In other words, if Plenitude is read in the light of Lewis's informal pronouncements, it *is* clear and *does* entail the existence of spread worlds. But if we confine ourselves to the official theory, and scorn such suspect remarks as mere 'gas', then the theory does not seem to be clear enough to afford an answer. To save Lewis's theory from contradiction it must be deprived of clarity. To paraphrase Lewis himself, 'this is one way to regain consistency. It is not a good way' (POW, p. 191). Nor does it help to cite Lewis's explicit rejection of Saturation. This simply shows that even Lewis can contradict himself (pages xi and 16 of his *Philosophical Papers* being at odds) and it still leaves us in the dark about *which* alien worlds and alien beings we are entitled to postulate.

Thus if Lewis is to avoid the disastrous consequences we have tried to fasten upon him, he must eat at least some of his words. We hope the 'Introduction' to his *Philosophical Papers* makes a healthy meal. But it will be a meal in the midst of confusion. We can't show that spread worlds follow from Plenitude. But he can't show that they *don't* follow either. We just don't know which aliens we are allowed to posit. Plenitude can be cleared

of overt inconsistency, but only because it is not clear what it implies. Furthermore the *adequacy* of Plenitude is called into question. Lewis's theory is supposed to 'get the facts of modality right', to do justice to our modal intuitions (POW, pp 154). Among these intuitions is the thought that every coherent supposition is possible or at least *logically* possible. Of course, if our argument is correct, this claim must be rejected (so long as we retain S₅ that is). However, a decent attempt to reconstruct our modal intuitions in the light of philosophical theory will come as close to this naive claim as it possibly can. But it now looks as if the official version of Plenitude falls a long way short of this ideal. And what is worse, we don't know *how far* short it falls. We can assume some alien entities, but apart from that, all we know is that we can't assume any that will induce contradictions in Plenitude. If Lewis's theory cannot do justice to our modal intuitions, we at least ought to know how much justice it is not doing.

Our claim then is that Plenitude in itself is unclear, but that if we interpret it in the light of Lewis's informal remarks it entails the existence of spread worlds. Some of our critics disagree. Plenitude *is* clear, or, at any rate, clear enough. It is just that we have not understood it properly. If we understood it we would see that it does not imply the spread worlds. This is not simply because the principle preserves a prudent reserve about which alien worlds we are entitled to posit. On the contrary, Plenitude, rightly understood gives us a clear conception of the worlds we are licensed to suppose, and the spreadworlds do not correspond to this conception. Indeed some of our critics seem to think that Plenitude *prohibits* such modal monstrosities. And it does this (presumably) without the aid of modal primitives.

Our basic trick is to devise world-descriptions which are internally consistent but which cannot be allowed to describe genuine worlds. What is wrong with these descriptions? According to Richard Miller, 'spread world descriptions are cooked up by adding absolutely unrestricted modal statements to genuine world-descriptions. But this is not the approved way that new world descriptions are cooked.' Modal statements (or at least *de dicto* necessities) 'are not part of the description of any world - they are part of the description of all worlds.' Spread world descriptions are cooked up by adding to the descriptions of *bona fide* worlds, statements which falsely describe *all* worlds. (Miller, 1990.) (Miller should say statements which *entail* such statements.) The answer, presumably, is to specify that world-descriptions do not describe worlds if they entail absolutely unrestricted modal statements which are false (i.e. statements which misrepresent logical space).

Now if this suggestion is intended as a 'new wrinkle' in the definition of Plenitude, a

restriction designed to deal with our problem cases, we have a ready reply. Fair enough, we say, such a restriction would probably do the trick. But it would also employ a primitive modality. And primitive modalities must be avoided by Lewis on pain of losing out in the philosophical price war. But perhaps that is not what Miller means. Perhaps he thinks that his restriction is *already* implicit in Plenitude?

This also seems to be what John Bigelow is driving at. The Lutherworld, he claims, is not (or would not be) a sum of worldmates! True, there is a possible world answering to the non-modal part of the description. But in attributing modal properties to its denizens we are implicitly quantifying over other worlds. The description therefore is not a description of one world, but perhaps of all of them. Furthermore the modal parts of this description are false since they are inconsistent with Plenitude. (Bigelow, 1989.)

Finally Greg Restall: 'Plenitude is not of the form - all first-order consistent sentences are true in some possible worlds - even if meaning-postulates are allowed. Because, first-order consistent sentences can talk trans-world in the way Lewis described, Lewis is careful to allow only certain first-order sentences as truly world-describing, and these are given by combinatorially recombining the "stuff" in worlds to "make" other worlds. This is a process of telling you what kinds of sentences are really world-describing. These are certainly not all of the first-order consistent sentences (even given meaning postulates).' (Restall, 1993.)

Bigelow and Restall then are making two (related) claims: a) that Plenitude does not license us to postulate worlds whose descriptions implicitly quantify over other worlds; and b) that by specifying that worlds are 'made' by recombining the 'stuff' in others worlds, Lewis gives us to understand which kinds of sentences are really world-describing. The sentences describing the spread worlds are not of the right kind. Why not? Because 'they talk about worlds other than themselves'.

Before answering these opponents we had better explain our own attitude to the modalities. Since we are critics of Lewis we are not committed to his reductive analysis. Necessity cannot be reduced to truth in all worlds nor can possibility be reduced to truth in some. There is more to modality than that. But we don't want to deny that *if* there were possible worlds of the kind Lewis supposes, *then* possible truths would be true in some of

them whilst necessary truths would be true in all¹⁴. So it is not quite correct to say that modal propositions implicitly quantify over possible worlds. Rather *given Lewis's metaphysical framework* they do so quantify. Or at least they *imply* propositions which quantify over worlds. Thus we are quite willing to admit that *in the context of Lewis's theory*, to postulate the Lutherworld is to make large claims about logical space. And the same goes for Plantinga's world as well.

Does Plenitude license us to posit worlds whose descriptions quantify over other worlds? Well, it can hardly *prohibit* such worlds or world descriptions. Although Lewis's ambition is to take the modality out of modality, to do this he must be able to translate plausible modal claims into his own idiom. This means that he must be able to talk about the essential properties of the entities he postulates. And this cannot be done in a non-trivial way without the aid of counterparts and hence of other worlds. Furthermore, in his *persona* as philosopher of mind, he is a functionalist who believes that beliefs and desires are characterized by the causal role they play in the explanation of the subject's behaviour¹⁵. It is only because of a complex set of dispositions that we can be said to have minds at all. And dispositions too require counterparts.

But perhaps this is not what our opponents are getting at. The point is rather, that the Principle of Plenitude only allows us to postulate possible worlds *one at a time*, so to speak, although once we've got them, the modal truths will re-emerge. There is a world (and hence a true world-description) containing Rebecca and her dispositions. But she has those dispositions (such as being a good seamstress) only because Plenitude (or perhaps just Recombination) has licensed us to endow her with a family of counterparts. In postulating the counterparts, we are not entitled to assume the dispositions to begin with. Similarly, if Charles is good at sketching, rather than someone who simply produces a

¹⁴ It is because they subscribe to this conditional that fictionalists about possible worlds are entitled to make use of them in elucidating the modal concepts. If your grasp of modal notions is a little shaky then the myth of possible worlds may be quite helpful. ('It's like this. Imagine there is a whole universe corresponding to every possibility ...') But such elucidations are not *explanations*. For a fictionalist, the modalities remain obstinately primitive.

¹⁵ See for instance Lewis (1966) 'An Argument for the Identity Theory', reprinted in Lewis (1983) pp. 99-107.

sequence of good sketches, this is because of the fine sketches produced by his counterparts under different conditions. But in postulating these counterparts we are not entitled to take his skill at sketching as a datum so as to derive the counterparts automatically. These must be 'manufactured' piece by piece through the mechanism of Recombination.

So the idea is that we are only allowed to postulate new worlds *if the entities involved are shorn of their modal properties*, though if we postulate enough of them we get the modal properties back later on. But if this suggestion is to be of any help to Lewis, our opponents must do two things. i) They must show that Plenitude *as currently formulated* does not allow us to postulate modally charged worlds. (Note the careful wording. Plenitude must not *allow*, or *imply the existence of*, modally charged worlds. But neither can it *prohibit* or *deny the existence of*, such worlds. It has to be agnostic.) And ii) they must show that this formulation does not employ a primitive modality.

Does Lewis *say* that the modal properties of an entity do not survive the process of duplication? Not in so many words. Indeed he could not say this as part of his official theory without making use of the modalities. But perhaps this is somehow implied or hinted at in what he does say? Let us first consider Lewis's examples of things that get duplicated. The list includes dragons, unicorns, puddles, protons, and talking heads (both detached and undetached). His favorite possibilia are talking donkeys though whether they are aliens or arrived at by means of recombination he does not say. However they are definitely candidates for reduplication given that they exist somewhere in logical space. Now it seems to us that talking heads and talking donkeys are not really *talking* unless they are thinking heads and thinking donkeys. Tape-recorders and parrots don't talk or do so only by courtesy. Unless the head is disposed to respond in a reasonably intelligent way, it is not really a talking head. And the same goes for the talking donkey. So unless the head and the donkey are reduplicated together with their dispositions we haven't really reduplicated a talking head or a talking donkey. But dispositions require counterparts. And counterparts require worlds to house them. Hence the Principle of Recombination allows us - perhaps requires us - to postulate worlds in batches. You can't

duplicate a talking head without its counterparts - not if it is to be genuinely talkative that is.

But perhaps this talk of talking heads is just loose talk. Perhaps Lewis subscribes to a 'thin' conception of talking (according to which tape-recorders and parrots measure up) or perhaps he would be willing to concede that the talkativeness of the talking head is not one of the characteristics that its duplicate automatically inherits. Two things are duplicates iff (1) they have exactly the same perfectly natural properties, and (2) their parts can be put into correspondence in such a way that corresponding parts have exactly the same perfectly natural properties, and stand in the same perfectly natural relations (POW, p. 61). Natural properties are in some sense basic and explanatory in the way that gerrymandered and disjunctive properties are not. (Lewis is an admirer though not an adherent of D.M. Armstrong's theory of universals.) If talkativeness is not a natural property then the duplicates of the talking head will not be automatically talkative and hence possessed of counterparts. If dispositional, or more generally, modal properties are not natural, then the Principle of Recombination only allows us to posit one world at a time. Bigelow and Restall would appear to be right. We do not have a blanket license to assume worlds whose descriptions implicitly quantify over other worlds. But all this depends on the thesis that modal or dispositional properties are non-basic. And this claim seems to be a) difficult to state without making use of modal concepts, and b) false. Why can't we state the claim without recourse to modal concepts? We have answered that one already. Why is it false? Well, there is an elegant argument due to James Franklin (1986) designed to show that dispositional properties cannot be reduced to categorical properties in every case. Imagine a Democritean world in which the gross properties of matter are to be explained by the micro-properties of the atoms. In particular the dispositional properties of gross things are to be explained by the categorical properties - the shapes - of their smallest components. Democritus' model looks like a paradigm of the way the modal can be reduced to the categorical. Indeed, the popularity of the Democritean paradigm is one reason why dispositions fell into disrepute in the 17th and 18th centuries. But wait! The Democritean explanation is only going to work if the atoms are *rigid*, that is,

if their shapes do not degrade under impact or stress. But rigidity is a disposition. Hence dispositions have not been done away with after all. They are ultimate, basic or, to use Lewis's terminology, *natural*. (We may remark that *atomicity* which is also vital if the Democritean explanations are going to work is also a modal property: things are atomic if they *cannot* be broken up.) But if dispositions are basic to the creatures of Democritus' fancy, how much more so to the apparently ultimate particles that science has discovered! These look more like bundles of dispositions than anything else.

But even if Recombination did not permit us to assume the existence of modally charged worlds, there is more to Plenitude than Recombination. Sometimes at least we are entitled to assume alien worlds and alien entities, a privilege of which Lewis avails himself. He thinks that Gods are possible and hence that there are some worlds where a God exists. But the defining characteristics of Godhead are omnipotence (or at least almightiness), omniscience, and moral perfection. An omnipotent being is one which can ... well, it is not quite clear *what* omnipotence amounts to, but whatever it is, it is certainly a dispositional or modal property of a fairly spectacular kind. What is more, a God must not only possess these modal properties but possess them necessarily. To posit a God, therefore, is to posit a being with counterparts, and hence to quantify over other worlds besides the one the God inhabits. Indeed, to posit a God is to quantify over *all* worlds, since if a God is possible, then every world either contains a counterpart who is omnipotent, omniscient etc. or contains no counterpart of God. Since, we may presume, Lewis only assumes those entities that are licensed by Plenitude, the principle implies the existence of entities whose nature is such that they cannot be posited without quantifying over all possible worlds. Plenitude is a more relaxed - or perhaps more ontologically reckless - principle than Bigelow and Restall suppose.

10. Conclusion

Our original aim was to embarrass Lewis by positing worlds which undermined the Principle of Plenitude and led to paradox and contradiction. Because these spreadworlds *followed* from Plenitude, the principle would have to be amended and this would be

difficult to do without recourse to a modal primitive. Once Lewis was saddled with a modal primitive, his theory would lose its main selling point (one might say its *raison d'être*) and he would lose out in the philosophical price war. Lewis replied that Plenitude did *not* imply the spreadworlds and hence that he had no need for a modal primitive. We insisted that Plenitude does so imply the spreadworlds *if* it is interpreted in the light of Lewis's informal remarks. If these remarks are dismissed however, the theory becomes unacceptably vague. (We don't know which worlds, and in particular which alien worlds, we are entitled to posit.) Friends to Lewis (or at least, critics of our argument) claimed that the Principle of Plenitude *does* supply us with a clear idea of what worlds we are entitled to believe in and that the spreadworlds do not correspond to this idea. We argued that this allegedly clear version of Plenitude relies on the thesis that dispositional properties are not natural. This is not only false but cannot be stated without the aid of a modal primitive. Besides Lewis himself subscribes to worlds which cannot be posited without quantifying over other worlds.

This is not quite the knockout polemical victory we had originally hoped for. Lewis's theory survives though its value is diminished. One of the selling points of a good theory is clarity. And Lewis theory is not only vague on a crucial point but difficult to clarify without lapsing into contradiction or resorting to a modal primitive. Still we would like to do better. Like many philosophers we can't help thinking that Lewis's theory is *outrageous* (a sentiment expressed by Lycan with his highly colored talk of 'rape-and-loom' modal realism). However useful possible worlds may be, however brilliant Lewis's defense, this theory can't be right. (Hence the incredulous stares.) What's more, it ought to be possible to *disprove* it - or at least to make it so unattractive that it won't find any takers. But what we end up with is just one more argument that the price is wrong.¹⁶

¹⁶Our thanks to all those who have talked or corresponded with us about this matter, Mike Thrush, Jo Asscher, Ken Perszyck, Pavel Tichy, Denis Robinson, Richard Miller, Peter Milne, John Bigelow, Alvin Plantinga, Greg Restall, Chris Mortensen, Peter Forrest, David Armstrong and above all David Lewis. The paper was much improved as the result of a highly critical session at the 1993 AAP Conference in Adelaide attended by several of the above.

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