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ABSTRACT

In 'Quiddistic Knowledge' (Schaffer [2005]), Jonathan Schaffer argued influentially against the view that the laws of nature are metaphysically necessary. In this reply I aim to show how a coherent and well-motivated form of necessitarianism can withstand his critique. Modal necessitarianism -- the view that the actual laws are the laws of all possible worlds -- can do justice to some intuitive motivations for necessitarianism, and it has the resources to respond to all of Schaffer's objections. It also has certain advantages over contingentism in the domain of modal epistemology. I conclude that necessitarianism about laws remains a live option.

1 Introduction

In 'Quiddistic Knowledge' (Schaffer [2005]) Jonathan Schaffer argues that the view that the laws of nature are metaphysically necessary has no good motivation; that it is subject to devastating objections; and that it 'dissolves, on inspection, into an incoherent heap'[1] because the (anyway bad) motivations for it pull in different directions. In this paper I aim to show how a coherent and well-motivated form of necessitarianism can withstand his objections.

I don't dispute that some forms of necessitarianism are indeed subject to Schaffer's criticisms. And Schaffer is certainly right that the various forms have not

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[1] Schaffer [2005] p.13.

always been clearly distinguished. Nonetheless, I think that a coherent necessitarianism about laws is possible, and that it has certain theoretical advantages over contingentism. My strategy is to elaborate and motivate one particular necessitarian picture, and to show how it emerges unscathed from Schaffer's objections.

Roadmap: Section 2 describes my preferred form of necessitarianism, and sets aside some potential complications. Section 3 discusses Schaffer's critique of certain motivations for necessitarianism, and Section 4 responds to his direct arguments against the view. Section 5 is a conclusion.

2 Modal Necessitarianism

Schaffer distinguishes three different forms of necessitarianism:

Modal necessitarianism: The actual laws are the laws of all possible worlds.

Nomic necessitarianism: Properties are governed by the same laws in all worlds in which they are instantiated.

Causal necessitarianism: Properties have the same causal roles in all worlds in which they are instantiated.

While modal necessitarianism is clearly a view about laws, nomic necessitarianism and causal necessitarianism look like views about the individuation of properties. They say, respectively, that properties are individuated by their nomic roles and by their causal roles. Nomic necessitarianism and causal necessitarianism have had their defenders – for example, Shoemaker [1980, 1998], Swoyer [1982], Fales [1993], and Ellis & Lierse [1994]. But here my primary concern is with the modal status of laws rather than with the individuation of properties. My aim is to set out a plausible picture incorporating modal necessitarianism and to defend it against Schaffer's objections.

For simplicity, I will be assuming that actual laws govern only actually instantiated (fundamental determinable[2]) properties. If we were instead to allow that properties can exist uninstantiated while still being governed by the actual

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[2] Non-fundamental properties (like *being a river of beer*) and determinate properties (like *having a mass of exactly 2^{100} kg*) raise interesting complications which are mostly orthogonal to the question of the modal status of laws. I will set them aside.

laws, Schaffer's formulation of modal necessitarianism would be rendered consistent with the possibility of all sorts of processes that we typically think of as anomalous. Consider *schmass*, an 'alien' fundamental determinable property which resembles mass except that the attractive force between two schmassy objects varies with the inverse *cube* of the distances between them[3]. If the laws of the actual world govern uninstantiated fundamental properties such as schmass, for example by determining that schmasses would attract according to an inverse-cube law were any to exist, then the characterization of modal necessitarianism given by Schaffer is straightforwardly compatible with the metaphysical possibility of schmassy behaviour.

This compatibility was unintended[4], and it obscures the most interesting issues at stake. The central arguments of Schaffer's paper turn on whether we need particular types of possible world to play particular theoretical roles; so it is crucial to the dialectic that 'the worlds countenanced by modal necessitarianism are a proper subset of the worlds countenanced by nomic or causal necessitarianism.'[5]

Rather than proceed under the implicit assumption that actual laws govern only properties instantiated at the actual world, I will build this assumption directly into the view I wish to defend. According to my favoured version of necessitarianism, i) the actual laws are the laws of all worlds, and ii) the laws include a specification of which fundamental determinable properties are

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[3] This example was introduced by Fine [2002]. Despite its dubious physical credentials, it suffices to make the general point.

[4] Schaffer (personal communication) has confirmed that in Schaffer [2005] he presupposed that the actual laws govern only properties instantiated at the actual world. This presupposition is required to make sense of various aspects of his setup, for example: 'The nomic and causal necessitarian countenance all the worlds that the modal necessitarian countenances, plus some worlds with alien laws, provided that these alien laws only govern alien properties (properties distinct from the actual ones, and from any conjunctions or composites thereof). (Schaffer [2005] p.3.)

[5] Schaffer [2005] p.3.

instantiated[6]. In line with Schaffer's original terminological intentions, I will continue to use the term 'modal necessitarianism' to refer to this package deal[7].

I will appeal to one additional premise in my defence of modal necessitarianism. It is the premise that quantum indeterminism is a part of the actual laws of nature; that is, that the actual laws are indeterministic in roughly the sort of way indicated by quantum mechanics. This assumption, while obviously not in any familiar sense *a priori*, seems very likely to be true; and it is not in tension with modal necessitarianism. Schaffer is unwilling to grant this premise: he considers the deterministic Bohmian mechanics to be an 'empirically open possibility'[8]. I agree that the case for quantum indeterminism is not totally conclusive, and that the appearance of indeterminism could arise from a deterministic Bohmian conspiracy; but I do think that the case for quantum indeterminism is very strong. I am accordingly happy to make my conclusions conditional on this premise. (It should, however, be noted that I only use this premise in the course of responding to one of the arguments offered by Schaffer – his 'argument from counterfactuals'. My other responses do not rely on indeterminism.)

So, on to the arguments.

3 Motivating Modal Necessitarianism

Schaffer first seeks to undermine two arguments for necessitarianism: the 'argument from natural necessity' and the 'argument from sustaining counterfactuals'. He correctly notes that – if valid – these arguments would count in favour only of modal necessitarianism, the version of necessitarianism I seek to defend.

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[6] Fine [2002] likewise advocates building a specification of the fundamental determinable properties instantiated at any world w into the laws of nature of w. A referee points out that this assumption entails that it cannot be a chancy matter whether some particular fundamental determinable is instantiated. This consequence is interesting, but it doesn't strike me as terribly problematic.

[7] Few philosophers have expressed sympathy in print with this package of views. The most prominent example is Alexander Bird, who expresses cautious support for it under the label of 'strong necessitarianism' (Bird [2004], [2007]).

[8] Schaffer [2005] p.8.

I don't think the modal necessitarian should put much weight on the arguments Schaffer adduces. While there may be better arguments in their vicinity, as Schaffer formulates them they are unconvincing. And many necessitarians are in any case suspicious of *a priori* arguments for necessitarianism[9]. There might therefore seem little point in discussing Schaffer's arguments for modal necessitarianism. Nonetheless, I think they will help us get a clearer sense of the nature of the dialectic between modal necessitarianism and contingentism, so I will briefly outline them.

The argument from natural necessity

> (1) If the relation between properties and their powers is contingent, then like charges *might not* repel;
> (2) Like charges *must* repel;
> (3) Therefore: the relation between properties and their powers is not contingent.

Schaffer diagnoses this argument as equivocating on the modal strengths of the 'might not' and the 'must' which appear in premises 1 and 2 respectively. He claims that 'the "must" of natural necessity in (2) is a restricted necessity, and the "might" in (1) is unrestricted. Hence they are compatible.'[10] This objection initially seems successful. The response of the modal necessitarian will obviously be to deny that the 'must' in (2) is restricted; but that is too close to what is at issue in the debate over the modal status of laws of nature, so its denial is dialectically unavailable for use in a suasive argument against contingentism. (In other words, it would beg the question.)

In order to shore up the argument from natural necessity, modal necessitarians must independently motivate their claim that the 'must' in (2) is unrestricted. One promising strategy is to point out that the appeal to restricted necessity raises a new explanatory demand with a non-obvious answer: if it is unrestrictedly possible for like charges to repel, why should it matter to us whether it is impossible in some restricted sense? This line of argument has been pressed by Kit Fine (Fine [2002]) and by Alexander Bird (Bird [2007]), who protest that any number of distinct restricted necessities can be pressed into service. Why should we

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[9] My own view is that the best argument for modal necessitarianism is based on the many-worlds interpretation of quantum mechanics. (See Wilson [2011].) More commonly, necessitarians have attempted to support their view by arguing that it best makes sense of certain features of scientific practice.

[10] Schaffer [2005] p.7.

be interested in a form of necessity restricted to worlds which share the actual laws (natural necessity), any more than we are interested in a form of necessity restricted to worlds which contain wombats (wombat-necessity)? And doesn't the restriction strategy render the natural necessity of the laws themselves a 'cheap and trivial' matter of self-entailment[11]?

In the face of such arguments, contingentists typically pass on the explanatory burden by assimilating it to the project of explaining why the laws of nature matter to us. Insofar as the laws of nature matter more to us than does the existence of wombats, it is unsurprising that we should be more interested in a restricted necessity that corresponds to natural necessity than we are in a restricted necessity that corresponds to wombat-necessity. Even if like charges might not repel, unrestrictedly speaking, learning that they repel in all the worlds which share our laws is interesting and informative just if a restriction to worlds which share our laws is an interesting and relevant restriction.

I am unhappy with this buck-passing response. Contingentists, it seems to me, have not adequately addressed the challenge of explaining why laws of nature matter to us. At most, they have tended to gesture at arguments of this sort:

> "On the working hypothesis that the laws of a world are the generalizations that fit into the best deductive systems true there, we can also say that the laws are generalizations which (given suitable companions) are highly informative about that world in a simple way. Such generalizations are important to us. It makes a big difference to the character of a world which generalizations enjoy the status of lawhood there. Therefore similarity and difference of worlds in respect of their laws is an important respect of similarity and difference..."
>
> Lewis 1973 p.74-75.

For Lewis, this is uncharacteristically vague; and, to my knowledge, he nowhere attempts to be more precise. Can contingentists do any better? Perhaps[12]. But it seems unlikely that any contingentist explanation of why the laws matter could improve on the necessitarian explanation, which is striking in its elegance and simplicity.

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[11] Fine [2002].

[12] Sophisticated frequentist attempts like those of Howson and Urbach [1993], Hoefer [2007] and Schwarz [forthcoming] to prove versions of Lewis' Principal Principle may help the contingentist make progress in this direction, linking chancy laws to subjective expectations about particular events via the chances that the laws assign to those events. See Strevens [1999] and Handfield [2012] ch.7 for sceptical views of this project.

According to the modal necessitarian, laws of nature matter to us because they are true at all possible worlds. Open natural possibilities *really could happen*: they are genuine possibilities, not merely epistemic possibilities. In contrast, histories violating the laws of nature are not genuine possibilities and can be safely ignored. Put another way, the epistemic norm 'assign credence zero to genuine impossibilities' seems to explain the relevance of physical necessity in the context of modal necessitarianism, while being explanatorily impotent in the context of contingentism[13].

Contingentists face a substantial challenge in explaining why physical necessity matters to us, while necessitarians have an attractive and simple explanation available. (An alternative way to put this point is that reading the 'must' in premise (2) as a restricted necessity generates an additional explanatory demand, a demand which simply does not arise for the modal necessitarian.) I conclude, following Bird [2004], that modal necessitarianism has a significant explanatory advantage over contingentism.

These explanatory considerations tell against the contingentist treatment of natural necessity as a restricted necessity. And if the best semantics for assertions like (2) does not involve a restricted modality, then there is no equivocation between (1) and (2), and the argument from natural necessity stands.

The argument from sustaining counterfactuals

(4) If the relation between properties and their powers is contingent, then there is nothing that guarantees that like charges repel in any other possible world;
(5) In the nearest possible world, like charges repel;
(6) Therefore: the relation between properties and their powers is not contingent.

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[13] Of course, the non-modal norm 'assign credence zero to falsehoods' subsumes the modal norm 'assign credence zero to genuine impossibilities'. But it seems like the modal norm is in some real sense easier for us to follow than the non-modal norm, and is thus more explanatory of our epistemic practices. By comparison, 'apportion your beliefs to the evidence' is an easier norm to follow than 'believe all and only the truths'; and thus the former is more explanatory of our epistemic practices than the latter, despite the capacity of the former to produce false beliefs even when followed correctly.

Schaffer's response to the argument from sustaining counterfactuals is to deny that the consequent of (4) is inconsistent with (5). He contends that even if charges repel in some possible worlds, there can be a guarantee that charges repel in the nearest possible world *if fixity of laws is partly constitutive of nearness*, as is the case according to the influential set of criteria for nearness of worlds set out by Lewis (Lewis [1979]).

This response of Schaffer's is closely related to his appeal to restricted modality in responding to the argument from natural necessity. Now the relevant restriction is being applied indirectly (and defeasibly) through the Lewisian criteria for nearness. And just as the restriction strategy for natural necessity raises a new explanatory demand − that of explaining why we should be interested in the restriction imposed by the laws of nature − so the use of a nearness relation which incorporates fixity of laws raises a new explanatory demand − that of explaining why we should be interested in a counterfactual construction incorporating a nearness relation restricted in this way. After all, a whole variety of nearness relations can be combined with the Lewisian possible-worlds framework for counterfactuals. The conception of nearness which incorporates fixity of laws seems to get the right results when it comes to matching our intuitive judgements; but we are left with no explanation of why it gets the right results, and with no explanation of why such a conception of nearness should be embedded so deeply into our practices of reasoning about potentially-non-actual situations.

Lewis simply assimilated the question of why the counterfactual construction incorporating his particular nearness relation should be of interest to us to the question of why laws should be of interest to us. And as I argued above, modal necessitarians seem to have a significant advantage over contingentists on this point. Accordingly, the modal necessitarian has an extremely simple explanation of why the counterfactually nearest worlds tend to have the same laws as the actual world; it is that *all* worlds have the same laws as the actual world. It is hard to imagine a contingentist explanation which could match this in simplicity.

One key idea can be extracted from the two arguments for necessitarianism that Schaffer discusses. It is that positing possible worlds with laws other than the actual laws generates an obligation to explain why we do not and should not take any account of these worlds in our deliberations. The necessitarian can appeal to the simple and general epistemic norm 'assign credence zero to genuine impossibilities' in explaining why in our modal and counterfactual deliberations we tend to hold the actual laws fixed. The contingentist must give a more complex story, and it remains to be seen whether any such story is forthcoming.

4 Defending Modal Necessitarianism

Taking himself to have undermined the main motivations for necessitarianism, Schaffer moves on to providing direct arguments against necessitarianism. He offers five: from modality, from counterfactuals, from propositions, from conceivability, and from recombination. There is a common form to these arguments: in each case, Schaffer argues that the best philosophical theory of the topic in question relies essentially on contingentism. There is also a common form to my replies: in each case, I will argue that the contingentist theory that Schaffer offers is not clearly superior to the modal necessitarian alternative.

The argument from modality

The contingentist analyses natural necessity as a restricted form of necessity. According to Schaffer, only this theory 'can assimilate natural necessity to the general pattern of restricted necessities found across the historical, epistemic, deontic and conventional necessities.' (Schaffer [2005] p.8.)

The necessitarian response to this argument should be to embrace the conclusion. It is not at all clear that natural necessity *should* be assimilated to this general pattern[14]. There are obvious differences between natural necessity and the restricted forms of necessity that Schaffer mentions. Most obviously, there is the intimate connection between natural necessity and counterfactual truth. And there is independent reason, as I have argued above, to think that the conception of natural necessity as a restricted necessity is problematic.

The modal necessitarian picture can still accommodate restricted modalities such as historical modality, of course: the restrictions are simply placed onto a space of possible worlds which includes only worlds in which the actual laws hold. If some restricted modality serves interesting theoretical purposes when applied to an unrestricted contingentist space of possible worlds, then it ought to serve the same sort of theoretical purposes when applied to the modal necessitarian space of possible worlds.

This is not to say that the various restricted modalities will serve these purposes *as successfully* in the context of necessitarianism as they do in the context of contingentism. The move from treating each restricted modality as a restriction

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[14]   Note that the analysis of epistemic modality as restricted is by no means universally accepted. A consequence of the analysis is that all metaphysically necessary truths are epistemically necessary; but we certainly lack knowledge of many of the metaphysically necessary truths of mathematics and of logic.

on the contingentist space of possible worlds to treating it as a restriction on the modal necessitarian space of possible worlds involves dropping some worlds. Contingentists will naturally protest that these dropped worlds – worlds which are compatible with the restriction but which have alien laws – can often serve important theoretical purposes. For example, these alien worlds might be needed to ground 'counter-legal' counterfactuals, or to provide content to propositions inconsistent with the actual laws. These objections are treated separately by Schaffer, and they are the topic of the next two subsections. If they are successful, that is bad news for modal necessitarianism; but then the argument from modality itself is doing none of the damage.

I conclude that the strategy which analyses natural necessity as a restriction of metaphysical necessity is not clearly superior to modal necessitarianism, which simply identifies natural necessity with metaphysical necessity.

The argument from counterfactuals

Schaffer argues that the best account of counterfactuals requires that we recognise possible worlds containing *miracles*: small violations of the actual laws. Miracles of this sort are selected for by the criteria for nearness of possible worlds set out in Lewis [1979]; they allow the closest antecedent worlds to match the actual world exactly up to some time, and then to smoothly diverge in such a way as to make the antecedent true. Without worlds containing miracles, if the laws are deterministic then the closest worlds in which an antecedent which contradicts actuality holds will be worlds in which the initial state of the universe is different[15].

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[15] It is not clear why this amounts to a serious problem. Although counterfactuals like 'had I scratched my nose just now, the initial state of the universe would have been different' seem false, so do counterfactuals like 'had I scratched my nose just now, a small miracle would have occurred'. We might further suspect that part of the resistance to the former counterfactual derives from the feeling that it incorrectly indicates that my nose-scratching caused the initial state to be different. If we cancel this implication by use of the form 'had I scratched my nose just now, the initial state of the universe would have had to have been different', the result no longer seems obviously false (especially if we are explicitly attending to the possibility of determinism). In contrast, 'had I scratched my nose just now, a small miracle would have had to have occurred' still seems false. So an alternative possible route for modal necessitarians is to accept unlimited back-tracking; this allows modal necessitarianism to be reconciled with deterministic laws without giving up on widespread counterfactual truth. See Wilson, J. [forthcoming] for further discussion.

Miracles, by reducing the amount of 'back-tracking' required to make true the antecedent, allow determinism and our intuitive judgments about counterfactuals to co-exist. With miracles on board, determinism does not ensure that had I scratched my nose just now the state of the universe at the big bang would have been different.

I agree that this argument spells trouble for the modal necessitarian who wants to reconcile the thesis that the actual laws are deterministic with the denial that, were things to differ from actuality in any way, the initial state of the universe would have been different. But this is not an attractive position for a modal necessitarian to adopt. Rather, the best form of modal necessitarianism will involve the claim that the actual laws involve quantum indeterminism, and hence that *the laws of all possible worlds are indeterministic*.

The assumption that the laws are necessarily indeterministic allows the modal necessitarian to account for counterfactuals without appealing to worlds involving violations of law. There are two ways in which this can be done. Either the modal necessitarian can replace miracles with highly unlikely but still lawful 'quasi-miraculous' quantum fluctuations, and preserve the rest of the Lewisian semantics for counterfactuals unchanged[16]; or the modal necessitarian can adopt an alternative semantics which makes more thoroughgoing use of indeterminism, and which does not appeal to miracles or quasi-miracles at all. One promising proposal of this latter sort is offered by Maudlin [2007]; but there are many ways in which such theories can be developed[17]. But, more conservatively, the modal necessitarian can resist the argument from counterfactuals simply by adopting the modified Lewisian semantics which replaces miracles by quantum quasi-miracles.

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[16] Might there turn out to be too few low-chance quantum-mechanical events to play the role of miracles in the Lewisian semantics? While this is perhaps an open empirical question − if something like Robin Hanson's 'mangled worlds' hypothesis (Hanson [2003]) turns out to be correct, there may be no quantum possibilities involving extremely unlikely events − I think the evidence is pretty strong that quantum mechanics will allow for analogues of the kind of 'small miracles', localized in time and space, which are needed for the Lewisian counterfactual semantics.

[17] An advantage of this approach is that it does not render true counterfactuals like 'if I had scratched my nose just now, a highly unlikely quantum event would have had occurred'. Other motivations for the approach might include the worries raised by Hawthorne [2005] and Hajek [MS] about the interaction of the Lewisian theory of counterfactuals with indeterministic laws. Some potential responses are canvassed by Williams [2008]. But we can set these worries aside here, since they apply to contingentism as much as to modal necessitarianism.

Of course, relying on quantum indeterminism to account for counterfactuals makes modal necessitarianism hostage to empirical fortune. But I am happy to accept the risk that future developments will reveal that the world is deterministic, since I take that outcome to be extremely unlikely.

A natural concern about these modal necessitarian treatments of counterfactuals is that they will be unable to handle 'counter-legal' counterfactuals, those in which the antecedent is inconsistent with the actual laws of nature. But this limitation derives from an inherent limitation of possible-worlds semantics for counterfactuals. Like it or not, everyone is stuck with a large class of 'counter-possible' counterfactuals which cannot be given non-trivial truth-conditions in possible-worlds terms: those with antecedents which are logically impossible or conceptually impossible, or which are inconsistent with Kripkean *a posteriori* necessities. The modal necessitarian adds some more counterfactuals to this class; but a separate treatment of counter-possibles (perhaps a pragmatic one, if they are to be counted as trivially true) is anyway essential to a possible-worlds counterfactual semantics.

One common source of discomfort with this necessitarian response has been the thought that discovering whether determinism is true or false at the actual world shouldn't make any difference to the correct semantics for counterfactuals. If we were to discover that the actual laws were deterministic, so the argument runs, then we would need to adopt a semantics for counterfactuals which allows for non-trivial truth-conditions in a world with deterministic laws[18].

This argument fails because it makes essential use of a counterfactual conditional which is, according to the necessitarian, a counter-possible conditional. If modal necessitarianism is true and the laws of the actual world are indeterministic, then the discovery that determinism holds is itself an impossible one.

Stated using indicative conditionals, the argument is uncompelling. If the actual laws are deterministic, then indeed the best semantics for counterfactuals will not rely on indeterminism. But the truth of this indicative conditional is quite consistent with the claim that deterministic laws are metaphysically impossible. To generate a difficulty for modal necessitarianism we would need the subjunctive

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[18] A variant of this argument assumes that we can know that certain counterfactuals have non-trivial truth-conditions even in advance of knowing whether the actual laws are indeterministic, and concludes that non-trivial truth-conditions for counterfactuals must be recoverable under determinism.

form of the conditional; but the modal necessitarian can coherently regard this form as a counter-possible counterfactual, neutralizing the threat it poses.

Another way to make this point is to draw an analogy with the following argument: *if there were no possible worlds, then the best semantics for counterfactuals would not be a possible-worlds semantics. Since possible worlds may turn out not to exist, we should reject possible-worlds semantics for counterfactuals.* Nobody will be willing to accept this argument. When the argument is posed in subjunctive form, the friend of possible-worlds semantics should think of it as a counter-possible counterfactual. And when posed in indicative form, it is no threat to the internal consistency of possible-worlds semantics. (This is essentially the response of Handfield [2004] to the argument against necessitarianism from counter-legals.)

This discussion underlines the need for users of the possible-worlds semantics for counterfactuals to make a clear distinction between subjunctive and indicative readings of conditionals[19]. Given modal necessitarianism, if we are unsure whether some conditional is a counter-possible, then we will be unsure whether it has a subjunctive reading with non-trivial truth-conditions. But this is an unavoidable feature of the possible-worlds semantics for subjunctive conditionals. According to possible-worlds semantics, subjunctives are to indicatives as objective chances are to subjective credences, and as metaphysical possibility is to epistemic possibility. Ascribing falsity to a counter-possible subjunctive conditional is like ascribing a non-trivial objective chance to a mathematical proposition: it betrays a misunderstanding of the modal status of the subject-matter. But, as I have emphasized, this feature of the possible-worlds semantics is quite independent of modal necessitarianism.

The thought that violations of law are not needed for the best account of counterfactuals is an unfamiliar one. That is because work on counterfactuals tends to take for granted that deterministic laws are a metaphysical possibility, and that we must accordingly allow for the truth of ordinary counterfactual judgements to be recoverable in deterministic worlds. That is, work on counterfactuals tends to presuppose contingentism. But this does not amount to any kind of argument.

If modal necessitarianism is correct, then the best semantics for counterfactuals will not involve worlds containing genuine miracles. But if the actual laws are quantum-indeterministic, then a semantics for counterfactuals

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[19] The use of these terms is philosophically standard, but grammatically incorrect. See Bennett [2003], Section 5.

which appeals to quantum indeterminism can mimic (or replace) the Lewisian semantics involving genuine miracles. Schaffer's argument from counterfactuals accordingly has no force against the modal necessitarian who accepts quantum indeterminism.

The argument from propositions

Schaffer's argument from propositions is straightforward. He assumes that propositions can be identified as sets of worlds, and that there are contentful propositions describing the violation of laws of nature. An example which is intended to underwrite this latter assumption is that 'a misinformed scientist might believe that like charges attract'[20].

Here is the way that Schaffer formalizes the argument:

(7) If the relation between properties and their powers is necessary, then there is no contentful proposition that like charges attract;
(8) There is a contentful proposition that like charges attract;
(9) Therefore: the relation between properties and their powers is not necessary.

Schaffer suggests that the necessitarian will reject (8), and will explain away our attraction to it by saying that we confuse the proposition that like charges attract for the proposition that like schmarges schmattract. This explanation is not available to modal necessitarians, who deny the metaphysical possibility of schmarge. But modal necessitarians have other lines of response available to what is really a familiar dilemma. Consider an analogous argument:

(7a) If the relation between numbers and number-theoretic truths is necessary, then there is no contentful proposition that Fermat's Last Theorem is false;
(8a) There is a contentful proposition that Fermat's Last Theorem is false;
(9a) Therefore: the relation between numbers and number-theoretic truths is not necessary.

Nobody will be willing to accept the conclusion of this argument. But reasons for rejecting it may differ.

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[20] Schaffer [2005] p.9.

Some philosophers will say that there is indeed a contentful proposition that that Fermat's Last Theorem is false – it is just that this proposition is necessarily false. Saying this requires a theory of propositions more fine-grained than the propositions-are-sets-of-worlds theory. (I am assuming that the null proposition, true at no world, is not 'contentful' in Schaffer's sense.) Such philosophers will reject (7a). But if (7a) is rejected then there seems to be no reason to uphold (7)[21]; and the argument from propositions fails.

To give the argument from propositions any chance of success, we must grant Schaffer the assumption that the coarse-grained sets-of-worlds theory of propositions is correct. But even granting this assumption, the argument can be resisted by the modal necessitarian. Given the coarse-grained conception of propositions, the modal necessitarian will deny (8), for the same reason that proponents of the coarse-grained conception deny (8a). It need not always be obvious, even to competent speakers of a language, whether a given grammatical sentence expresses a contentful coarse-grained proposition. Whichever conception of propositions they prefer, then, the modal necessitarian can resist the argument from propositions.

The argument from conceivability

Schaffer's argument from conceivability maintains that the link between conceivability and possibility is an indispensable part of modal epistemology, and that the modal necessitarian 'is committed to a complete collapse of any conceivability-possibility link'[22]. He formulates the argument from conceivability as follows:

(10) If the relation between properties and their powers is necessary, then it is inconceivable that like charges attract;
(11) It is conceivable that like charges attract;
(12) Therefore: the relation between properties and their powers is not necessary.

Schaffer expects the necessitarian to respond by saying that that (11) is false, and that when we take ourselves to be conceiving that like charges attract, we are in fact conceiving that like schmarges schmattract. He correctly maintains

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[21] Perhaps like charges attracting is *conceivable* while mathematical falsehoods aren't. But to press this point is to change the subject from the argument from propositions to the argument from conceivability, discussed in the next subsection.

[22] Schaffer [2005] p.12.

that this response is not available to the modal necessitarian, but only to the causal or nomic necessitarian, and quite reasonably criticizes it as lacking independent motivation.

In contrast, modal necessitarians have a quite different response available. They can deny that there is any such possible property as schmarge, or any such possible behaviour as schmattraction, but nevertheless reject the idea that this requires charges attracting to be inconceivable. This response involves denying that conceivability entails possibility, and rejecting (10). Whether it is conceivable that like charges attract depends on us, and on our conceptual apparatus. Whether the relation between properties and their powers is necessary depends not at all on us or on our conceptual apparatus, but on the properties and powers themselves. (10) is *prima facie* implausible.

Schaffer does in fact go on to provide additional support for (10). In a footnote he argues that 'conceivability seems to be our main guide to knowledge of what is possible. This suggests that it is preferable to restrict conceivability rather than reject it outright, on pain of modal skepticism[23].' This motivation for the conceivability-possibility link may be persuasive to the contingentist (who faces notorious difficulties when it comes to modal epistemology, and who might well choose to embrace a problematic epistemology rather than to give up on the project altogether) but it is totally unpersuasive for the modal necessitarian.

According to modal necessitarianism, modal epistemology is continuous with ordinary epistemology. While it does not itself entail many particular modal truths, modal necessitarianism does remove the need for a distinctive epistemological route to modal knowledge. Fundamental physical theories, if true, comprise metaphysically necessary truths according to modal necessitarianism; and the state space of the true fundamental physical theory faithfully represents the space of genuinely possible worlds.

Once modal epistemology is assimilated to general scientific epistemology in this way, the inference from conceivability to possibility looks thoroughly dubious. For p to be conceivable, for a modal necessitarian, is just for p to be conceived in some possible world; that is, for p to be conceivable is for an event of conceiving-that-p to be compatible with the fundamental laws of nature of the actual world. There is of course no entailment from 'p is conceived' to 'p is true' – so why should there be any entailment from 'p is possibly conceived' to 'p is

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[23] Schaffer [2005], p.26.

possibly true'? Only a perceived lack of any alternative route to modal knowledge could lead us to rely on the conceivability-possibility inference.

Far from presenting a problem for modal necessitarianism, the unification of modal epistemology with general scientific epistemology that it involves is one of the strongest points in its favour. Modal necessitarians require no special epistemology for modal truths, and they need not rely on the problematic conceivability-possibility link. The argument from conceivability is accordingly impotent against modal necessitarianism.

The argument from recombination

Schaffer's final argument against necessitarianism runs as follows:

(13) If the relation between properties and their powers is necessary, then some combinations of charge and acceleration would be impossible;

(14) All combinations of charge and acceleration are possible;

(15) Therefore: the relation between properties and their powers is not necessary.

As should be obvious, the modal necessitarian will deny (14), and maintain that not all combinations of charge and acceleration are possible. There are two viable ways to underwrite this denial.

The first way is to appeal to the thought that charge and acceleration are not 'distinct existences', maintaining recombination (as Schaffer states it, that if x and y are distinct existences, then there is a possible world with just x, a possible world with just y, and a possible world with x and y). Schaffer anticipates this necessitarian response, and argues that it 'preserves the letter of recombination, but dashes its spirit.'[24] The argument given for this conclusion involves the supposition that the laws are deterministic. For reasons discussed above, the necessitarian need not grant this supposition: the best form of necessitarianism has it that the laws are necessarily indeterministic. However, Schaffer's rebuttal of the necessitarian response fails even on the assumption that the actual laws are deterministic.

The rebuttal starts with the observation that 'every actual existence is a correlate of a common cause: the Big Bang' and argues that, if necessitarianism and determinism are true, that entails that 'zero recombination of actual existences is

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[24] Schaffer [2005], p.12.

allowed. The world has become an indivisible Parmenidean unity, the essential outpouring of the initial singularity. This is not a minor restriction on recombination, but rather an unprecedented rejection of any recombination of actual elements[25].'

This argument fails because it neglects that the necessitarian may hold that the actual initial conditions of the universe are contingent, even if the actual laws are necessary. Schaffer recognises this option in a footnote, but dismisses it as a route to reclaiming recombination: 'Perhaps sometimes this is possible. But, I suspect, it will still drastically limit recombination of actual elements, far beyond what intuition permits[26].' But he has not provided any argument that the restriction on recombination which determinism and modal necessitarianism jointly produce is as extensive as he suspects it is[27].

In the same footnote, Schaffer complains that linking recombination to the contingency of initial conditions renders recombination an *a posteriori* matter. I see this result as a virtue of modal necessitarianism rather than as a vice. Modal necessitarians will typically be unmoved by appeals to intuition about what is possible; their modal epistemology is *a posteriori* and scientific, not *a priori* and intuition-based.

The second way modal necessitarians can resist the argument from recombination is to abandon recombination altogether, and to give an alternative characterization of modal space. Modal necessitarianism gives us rich resources for doing this; according to modal necessitarianism, the state spaces associated with physical theories themselves comprise naturalistic descriptions of the general features of the space of genuinely possible worlds. This second option is the one that I prefer. Just as the role that the inference from conceivability to possibility plays in contingentist modal epistemology is rendered superfluous by modal necessitarianism, so may be the role that recombination plays in contingentist modal metaphysics.

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[25] Schaffer [2005], p.12.

[26] Schaffer [2005], p.27.

[27] Even if an argument of this sort can be provided, the modal necessitarian could fall back on the assumption that the laws are necessarily indeterministic. Wherever there are independent chance events, all combinations of their possible outcomes are possible: this undermines the thought that the world is 'the essential outpouring of the initial singularity'.

Even for modal necessitarians who are friends of recombination, the argument from recombination can be rejected. And for modal necessitarians who reject recombination and give a naturalistic characterization of modal space, the argument has no force at all.

5 Conclusion

I have replied to Schaffer's criticisms of two arguments for modal necessitarianism, and I have shown how his direct arguments against necessitarianism lack any force against a modal necessitarian who takes the actual laws to be quantum-indeterministic. In the process, I have highlighted some advantages of a necessitarian modal epistemology over a contingentist modal epistemology. I conclude that the modal status of the laws of nature remains very much an open question[28].

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