STRONG NECESSITARIANISM: THE NOMOLOGICAL IDENTITY OF POSSIBLE WORLDS

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Abstract

Dispositional essentialism, a plausible view about the natures of (sparse or natural) properties, yields a satisfying explanation of the nature of laws also. The resulting necessitarian conception of laws comes in a weaker version, which allows differences between possible worlds as regards which laws hold in those worlds and a stronger version that does not. The main aim of this paper is to articulate what is involved in accepting the stronger version, most especially the consequence that all possible properties exist in all worlds. I also suggest that there is no particularly strong reason for preferring the weaker to the stronger version. For example, Armstrong's instantiation condition on universals entails that according to strong necessitarianism every property is instantiated in all possible worlds. But first we do not need to accept Armstrong's instantiation condition, in part because his arguments for it are forceful only for a contingentist about laws and properties. Secondly, even if we do accept the condition, the consequence that all properties are instantiated is not itself contradictory, so long as any form of necessitarianism holds. Strong necessitarianism is *prima facie* counter-intuitive. But for that matter so is weak necessitarianism. Accepting either weak or strong necessitarianism requires denying the force of intuition in this area. And indeed we have every reason to deny the force of intuition and its primary source, imagination, concerning modal facts.

Introduction

The received and intuitive view of laws is that they are contingent. The laws that hold in this world might not have held in some other possible worlds while in yet other possible worlds laws hold that do not hold in this one. There have however been dissenters from this view. According to the dissenting view the laws of nature are necessary. This much is well known, though perhaps less well understood. What is certainly less well explored is the extent of that necessity.

Within the necessitarian camp there are two possible views. The weaker, more conservative view holds that laws are necessary in a sense similar to Kripke's necessity of identity. The claim □(Eric Blair = George Orwell) is consistent with there being possible worlds where Eric Blair/George Orwell does not exist.[1] The corresponding view for the necessity of laws is this. Laws concern properties. Properties may or may not exist in different possible worlds. The conservative necessitarian will say that the law L(P) concerning property P is necessary, and that this requires only that L(P) holds in all possible worlds where P exists. Just as worlds where Eric Blair was never born are not counterexamples to the claim □(Eric Blair = George Orwell), worlds where P does not exist are not counterexamples to the claim □L(P). What □(Eric Blair = George Orwell) rules out are worlds where Eric Blair and George Orwell exist but are distinct individuals. What □L(P) rules out are worlds where P exists but is not governed by the law L(P) (worlds where P exists but is governed by other laws or by no laws at all). Thus □L(P) is consistent with there being worlds in which L(P) is not a law. It is also consistent with there being worlds where there exist properties Q, R etc. that do not exist in our world. In a world where Q and R exist, they may be governed by laws L*(Q) and L†(R) that are not laws of our world. Of course □L*(Q) and □L†(R) will also be true in just the way that □L(P) is true. But on this weak version of the necessitarian claim about laws, it is possible both that □L*(Q) and that there is no law L*(Q) in the actual world. On this view possible worlds are nomologically consistent with one another. No world contains any fact that is a counterexample to a law that holds in any other world. But worlds may be nomologically distinct in that a law that exists in one world may not exist in another world.

The more radical necessitarian view of laws requires more than is provided for by the analogy with identity. According to strong necessitarianism laws of nature are necessary (in the sense explained above) and furthermore in each possible world all laws

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[1] This is true whether one prefers the view that '□(Eric Blair = George Orwell)' is true because 'Eric Blair' and 'George Orwell' denote the same individual at all possible worlds where Blair or Orwell exists, or the Kaplan view that the proposition 'Eric Blair = George Orwell' asserts of some actual individual (Blair/Orwell) that he is identical with himself, a proposition whose truth value is insensitive to changes in the possible worlds at which it is evaluated, and so is true even at world where Blair/Orwell does not exist (because, to use Kaplan's imagery, Blair/Orwell is loaded into the proposition, before it makes its round-the-worlds journey). (Kaplan 1989, p. 569).

indeed hold, and so the properties they involve exist. Let us distinguish between the truth of a law proposition at a world and the holding of a law at that world. This would match the distinction between the truth of a proposition such as the proposition that Blair is Orwell and the fact of Blair's existence and identity with Orwell. Arguably the proposition can be true of a world where the fact does not exist.[2] So the weak necessitarian view of laws expressed is the preceding paragraph is this:

(WN) $L(P) \rightarrow \forall w$(it is true of w that $L(P)$);

while strong necessitarianism is as follows:

(SN) $L(P) \rightarrow \forall w(L(P)$ holds at $w)$

where:

(LH) $L(P)$ holds (exists) at w iff it is true of w that $L(P)$ and P exists at w.[3]

Let us reserve '$\square$' for the weak necessitarian view, while '$\square^+L(P)$' abbreviates the strong necessitarian view. Let $L^*(Q)$ be a possible law, i.e. $\Diamond L^*(Q)$. Let then w^* be a world where $L^*(Q)$. According to strong necessitarianism, in w^*, $\square^+L^*(Q)$; and so $\Diamond\square^+L^*(Q)$ is true of the actual world. By S5, $\square^+L^*(Q)$. And so we have: $\Diamond L^*(Q) \rightarrow \square^+L^*(Q)$. By (SN) $\square^+L^*(Q) \rightarrow L^*(Q)$ holds at the actual world. And so: $\Diamond L^*(Q) \rightarrow L^*(Q)$ holds. Since $L^*(Q)$ is an arbitrary possible law we can conclude that all possible laws hold in all possible worlds including the actual one. (The assumption of S5 is tantamount to (a) assuming that when I say that if the law $L(P)$ holds in the actual world then it holds in all possible worlds I mean *all* possible worlds, not just some proper subset of the possible worlds that are accessible from the actual world

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[2]   We may wish to distinguish between a proposition's being true *of* a world and its being true *at* a world. It is less plausible that a proposition can be true at a world where the corresponding fact does not exist. That the latter is false has been argued in (Williamson 2002). According to Williamson every particular exists, only that at some possible worlds the particular is a merely possible particular, while at the remainder it is concrete. (This view is more attractive than it might at first appear to be – it is the conclusion of a very plausible argument; it makes the Barcan formula true, thus permitting a very simple quantified modal logic) To take Williamson's view on board this paper would have to be rewritten with 'exists'; replaced by the equivalent of 'concrete' for facts and properties.

[3]   Armstrong (1983, pp. 163, 166) makes a distinction between strong and weak necessity along these lines. He takes ordinary necessity as applied to laws to be equivalent to my strong necessitarian view, i.e. $\square L(P)$, so weak necessitarianism is expressed thus: $\square^+$(the universal P exists $\rightarrow$ L(P)).

(i.e. the relevant accessibility relation is universal from the actual world) and (b) assuming that the actual world is not privileged as regards the accessibility relation (i.e. the relation is universal from all possible worlds).) According to Strong Necessitarianism there is no difference between possible worlds as regards their laws; nomologically, they are identical.

In this paper I shall argue that the more radical view is entirely consistent and deserves due consideration. The main aim of the paper is to make clear what is involved in holding the strong necessitarian view. While I shall not explicitly set out to defend the strong necessitarian view let alone claim that it is superior to all competitors, I will point out some of its advantages.

Dispositional essentialism and the necessity of laws

One might be a necessitarian about laws because one is a dispositional essentialist about properties. According to dispositional essentialism properties, at the very least those sparse properties that appear in the fundamental laws of nature, have dispositional essences.[4] (I shall say more about what we mean by 'property' in this context below.) The real essence of such a property includes a disposition to give some particular characteristic manifestation in response to a characteristic stimulus. So, for example, it might be the essence of negative charge to repel other negative charges and attract positive ones.[5] Let some x possess the property P. On the dispositional view the essence of P is some dispositional character, $D_{(S,M)}$, the disposition to yield manifestation M in response to stimulus S:

(DE) $(Px \rightarrow D_{(S,M)}x)$.

Since (DE) describes the essence of P:

$\Box$(DE) $\Box(Px \rightarrow D_{(S,M)}x)$.

(I have said that dispositional essentialism says that properties have dispositional essences. It is a further claim that the individ-

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[4]   Cf. (Ellis and Lierse 1994) for dispositional essentialism.
[5]   Some dispositions will have stimuli that are typically or even necessarily always present. Typically two charges will always influence one another, if only slightly, even if they are very far apart. However, charges can be electrically isolated from one another. So in this case, the appropriate stimulus will be a matter of the charges not being electrically isolated from one another.

uation of properties is to be given by their dispositional powers. If this claim is added then the conditional in (DE) and $\Box$(DE) can be replaced by a biconditional – in effect maintaining that properties just are their dispositional powers. That difference will not affect what follows.)

The impact of this view on the laws of nature is that it makes the laws of nature necessary rather than contingent. On the simple conditional analysis of dispositional ascriptions the following holds:

> (CA) x is disposed to give manifestation M in response to stimulus S if and only if were x to receive stimulus S, then x would yield manifestation M.

If we symbolise the subjunctive/counterfactual conditional by '$\Box\!\!\rightarrow$' then (CA) can be abbreviated:

> (CA) $D_{(S,M)}x \leftrightarrow Sx \Box\!\!\rightarrow Mx$.

Since (CA) is an analysis of the concept of disposition it is necessary:

> $\Box$(CA) $\Box(D_{(S,M)}x \leftrightarrow Sx \Box\!\!\rightarrow Mx)$.

(DE) and (CA) give us:

> (I) $(Px \rightarrow (Sx \Box\!\!\rightarrow Mx))$.

Now consider any case where x, which is P, also acquires the stimulus S, i.e.

> (II) $Px \,\&\, Sx$.

By (I) and (II) we have:

> (III) Mx.

Discharging (II) we have:

> (IV) $(Px \,\&\, Sx) \rightarrow Mx$.

Since x is arbitrary we may generalise:

> (V) $\forall x((Px \,\&\, Sx) \rightarrow Mx)$.

We thus have a universal generalisation. The premises from which (V) was deduced were only (CA) and (DE), which is to say that the universal generalisation is a consequence solely of an analytic proposition, (CA), and the essence of the property P, captured in (DE). This means that such universal generalisations are

consequences of the dispositional essences of properties. In which case the argument given holds for all worlds where P exists. I.e. the conclusion, $\forall x((Px\&Sx) \rightarrow Mx)$, is necessary in at least the weaker sense discussed above. (In brief, $(CA)\&(DE) \vdash \forall x((Px\&Sx) \rightarrow Mx)$ therefore $\square(CA)$ & $\square(DE) \vdash \square\forall x((Px\&Sx) \rightarrow Mx)$.)

Since the generalisation is non-accidental it is a nomic generalisation. On one view of what laws are, (V) itself states a law of nature. This view would agree with Lewis that laws are regularities but disagree with Lewis very deeply about what makes one regularity a law and not another. On Lewis' view it is the fact that the regularity is a consequence of the optimal systematisation of all particular facts. According to the necessitarian (of this stripe) laws are those regularities whose truth is guaranteed by the dispositional nature of one or more of the constituent properties, in the way that the truth of (V) is guaranteed by the dispositional nature of P. Regularities that supervene on such laws will also be laws.

A different view is that the law in this case is a relation of 'necessitation' N among the universals P, S, and M: N(P&S,M). This would be analogous to Armstrong's view of laws. The difference is that for Armstrong N is a contingent relation among universals, whereas the necessitarian takes N to be a relation of metaphysical necessitation. On this view 'N' can be defined thus: N(F,G) iff $\square\forall x(Fx \rightarrow Gx)$.[6] In which case N(P&S,M) is a consequence of $\square(CA)$ & $\square(DE)$. Two of the criticisms levelled at Armstrong are that it is unclear what his relation of contingent necessitation is and that it is unclear how it is able to necessitate anything. Clearly these problems do not arise in this case.

The necessitarian can be reasonably relaxed as regards the question, 'what exactly are the laws of nature?', for two reasons. First, whatever one takes laws to be, the derivation of $\square(V)$ and so N(P&S,M) from $\square(CA)$ & $\square(DE)$ shows that dispositional essentialism can account for at least some of the laws of nature. An ambitious dispositional essentialist will claim that all laws of nature may be accounted for in this way – and it is the ambitious view that I am considering in this paper. Secondly, the dispositional essentialist view will regard the motor and cement of the

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[6]   This is a simplification, which will allow too many entailment relations to be regarded as nomological. It might be appropriate to restrict 'N' to those instances of '$\square$' that arise from the essence of some property in the manner just described.

universe as residing ultimately not in the laws themselves but rather in the dispositional nature of properties. The laws are, in a sense, epiphenomenal.

A correction to (CA)

The flaw with the dispositional essentialist account given so far is that (CA) is false. (CA) is false thanks to finks, antidotes, and mimics. For example, a particular instance of a disposition $D_{(S,M)}$ is finkish if there is some mechanism in its vicinity such that the characteristic stimulus S has the property of causing the disposition $D_{(S,M)}$ to go out of existence before it can produce its characteristic manifestation M. So, if a disposition is finkish we can have the disposition and its stimulus but without the manifestation occurring, contrary to (CA). In Charlie Martin's example, a wire is live – it is disposed to pass current to a conductor if the conductor is placed in contact with the wire (Martin 1994). This wire happens to be finkishly live; a mechanism exists that detects the presence of conductors and within a fraction of a second of the conductor touching the wire cuts the electricity generator, making the wire dead before it can deliver any current to the conductor. So at the very moment of touching the wire is live (disposed to deliver current to a conductor that is in contact with it) and the conductor is in contact with the wire; but no current is delivered to the wire. We have a disposition but the subjunctive conditional is false. In finkish cases the disposition is caused to disappear. In the cases of antidotes, the disposition remains but its normal operation is interfered with; that is, the environmental conditions upon which the disposition depends are altered (Bird 1998). A poison may be deadly, disposed to kill those who ingest it; but if an antidote is taken the body's physiology may be altered or protected so that the poison cannot do what it would otherwise have done. So long as the poison is not changed by the antidote, the disposition to kill if ingested must remain (assuming dispositions to be intrinsic properties); the poison is ingested; but it does not kill. Again we have a counterexample to (CA).[7]

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[7]   Mimics (cf. Johnston 1992) are cases where the counterfactual in (CA) is true but there is no corresponding disposition. Mimics refute the right to left implication in (CA) whereas the nomic necessitarian requires only the left to right direction.

Necessitarianism can withstand the falsity of (CA). Most commentators believe either that (CA) can be modified so as still to give an analysis of dispositional concepts, or that even if no analysis in the traditional sense is available, there is nonetheless an intimate metaphysical relationship between dispositional ascriptions and conditionals – which is roughly that so long as antidotes and finks etc. are absent, then, if x is disposed to M when S, then x will M when S.[8] For example, Stephen Mumford suggests a 'conditional conditional' account (Mumford 1998):

(CC) $D_{(S,M)}x \leftrightarrow Cx \rightarrow (Sx \;\square\!\!\rightarrow Mx)$.

This is not strictly an analysis since the conditions C (which Mumford takes to be ideal conditions) cannot be finitely and non-trivially characterised.[9] (CC) may nonetheless correctly represent a conceptual and metaphysical truth concerning the relationship between dispositional ascriptions and counterfactuals.

It is easy then to see how the necessitarian view can be rescued. If we replace (CA) by (CC) and $\square$(CA) by $\square$(CC) (the latter being permitted since (CC) is a statement of metaphysical fact even if not strictly an analysis), then we reach the conclusion: $\square\forall x(Cx \rightarrow ((Px\&Sx) \rightarrow Mx))$. It is worth noting that we do indeed have laws of this double conditional form, *ceteris paribus* laws, and it is plausible to suggest that the conditions encapsulated in a *ceteris paribus* clause are precisely the sorts of conditions (ideal conditions, absence of finks and antidotes etc.) that are covered by 'C'.

Strong necessitarianism and properties

Dispositional essentialism cannot itself decide between the weak (conservative) and the strong (radical) version of necessitarianism. While dispositional essentialism entails the weak view it is also consistent with the strong view. I shall in this section explore the strong necessitarian account in more detail in order to show that it is indeed consistent.

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[8] One modifier is Lewis (Lewis 1997). Mellor (2000) maintains that the link holds, absenting finks and antidotes.

[9] Mumford in fact defends the following: $D_{(S,M)}x$ entails if Ci then (if Sx then Mx). First it is clear that Mumford takes the conditional inside the parentheses to be a subjunctive/counterfactual conditional. Secondly Mumford says things that suggest that the entailment goes both ways. But as remarked (footnote 7) the current discussion requires only the left to right entailment.

A world in which L(P) is true and P does not exist is a refutation of strong necessitarianism. Since necessitarianism in general takes L(P) to be necessarily true if true in any world, it follows that strong necessitarianism must take P to exist at all possible worlds if L(P) is a law at any world. Let Q be a property that exists at some possible world *w*. Since Q has a dispositional essence there will be a law L*(Q) in which Q participates. Since all possible laws are actual and all actual laws are necessary, it follows that Q exists in the actual and in all other possible worlds. So any possible property is actual. The view that all laws hold in all worlds (understood non-trivially) entails the view that all (nomic) properties exist in all worlds.

What view of properties makes such a claim admissible? One view takes properties to correspond to possible predicates; properties are Fregean concepts. And there seems nothing objectionable in regarding all possible Fregean concepts as existing at all possible worlds. But there are three reasons why this is not a view of properties of which the necessitarian should avail him- or herself. First, this view leads to Russell's paradox. Admittedly, we might finesse this by somehow restricting the range of possible predicates that generate concepts, although no-one has yet come up with a natural way of so doing. Secondly, Russell's paradox arises because there are too many possible predicates; but there is also no guarantee that there are enough predicates to express all the properties we might want for the laws of nature. Perhaps there are properties that can be grasped by no possible mind and can be expressed by no possible predicate. It is entirely plausible that there are laws that cannot be known or understood by any mind. So there could be properties that do not correspond to any Fregean concept. Thirdly, and most importantly, the necessitarian wants to account for laws as flowing from the real essence of properties. It is implausible to suppose that Fregean concepts have real as opposed to merely nominal essences. But even if they do, those concepts and their essences are metaphysically too flimsy a foundation upon which to build an edifice of laws that govern the unfolding of the universe. Fregean concepts are what Lewis calls 'abundant' properties; we however are interested in what he calls 'sparse' properties, those which have the structure of the world to thank for their existence rather than the expressive possibilities of thought or language.

The most promising way to understand sparse properties is as universals. David Armstrong, the leading proponent of sparse

properties as universals, takes it to be a necessary condition on the existence of an universal at a world that it should be instantiated at that world (Armstrong 1997, pp. 38–53). On the strong necessitarian view every possible sparse property (universal) exists. Add to this Armstrong's instantiation condition, we have the conclusion that every possible universal is instantiated in the actual world. This may seem an implausibly strong conclusion. In the next section I shall examine Armstrong's grounds for the instantiation condition. In the section following that I shall ask whether the view that every possible universal is instantiated is really so implausible.

The instantiation condition

Armstrong's instantiation condition on universals is the modern equivalent of Aristotle's *in re* conception of substantial forms: the forms exist *through* substances. Aristotle's view conflicts with the Platonic *ante rem* conception of forms as existing independently of any object having them. Unlike the *in re* conception, the *ante rem* conception of universals would permit all properties to be actual without them all being instantiated.

Armstrong thinks of universals as ways in which things stand towards one another. He says it is implausible that there should be such 'ways' without there being things standing in such ways. To this Sydney Shoemaker replies that one could equally characterise universals as ways things *can* stand towards one another. And things could be thus and so without their actually being thus and so. Armstrong rejects this objection on the grounds that it makes universals necessary beings (Armstrong 1997, p. 38). This of course is no objection to the strong necessitarian who happily accepts this proposition. This consequence of uninstantiated universals is a problem only for someone adopting Armstrong's contingentist views about laws and properties. (It might be added that one could interpret Shoemaker's 'can' as a matter of nomic rather than metaphysical possibility – a way things could be in this world with its laws. So for someone like Armstrong who thinks laws are contingent, universals would still be contingent entities.)

Armstrong does marshal another argument against uninstantiated universals, viz. that they contradict the Eleatic Principle (Armstrong 1997, p. 41):

Everything that exists makes a difference to the causal powers of something.

While the Eleatic Principle is contentious and its correct formulation even more so, the necessitarian I am describing is certainly in sympathy with its motivation. Our necessitarian is a dispositional essentialist: properties have their causal powers essentially; indeed their causal powers may even serve to individuate properties. In this sense, the necessitarian can claim to adhere to the Eleatic Principle more closely that an Armstrongian or Humean contingentist, since the latter hold that the difference a property makes to the causal powers of things is only a contingent difference, whereas according to the necessitarian, properties make their differences necessarily. Armstrong's concern is that an uninstantiated property makes no difference to the causal powers of anything. What Armstrong means by 'anything' is any actual *particular.* To which a further pair of remarks may be made. First, if one is a genuine, full-blooded realist about universals, one should be happy to allow the 'anything' to quantify over universals as well. And the existence of an uninstantiated universal on the necessitarian view will indeed make a difference to the causal powers of something, principally itself, because it is itself identical with certain causal powers.

Secondly, the instantiation condition makes the existence of laws and properties implausibly sensitive to contingent differences (and nomically contingent difference at that) in the existence or even location of rare particulars. If, as Armstrong does, one admits that particulars exist contingently, it seems plausible that one ought to be able to have two worlds that are alike in respect of their laws but differ in that one has a particular that the other lacks. But Armstrong's position is incompatible with this. For one may imagine a law L involving a universal U where the only particular in world w_1 that is affected by this law and instantiates U is the particular **a**. Now consider w_2 which is as similar to w_1 as can be except that **a** does not exist in w_2. On Armstrong's view U cannot exist in w_2 and so neither can L. There seems no reasonable explanation as to why the removal of a contingently existing entity should also remove a law. The problem is made more intense when we consider that the difference between w_1 and w_2 need not be a difference in **a**'s existence but in **a**'s location. Let **a** and **b** be entities (and the only entities) of kind K. In w_1 **a** is 0.9m from **b**; and in w_1 there is a law L that

states that entities of kind K that are less than 1 m apart interact in manner M, where M is a universal exclusive to this law (i.e. nothing else other than **a** and **b** are M in w_1). In w_2 **a** and **b** also exist and are the only K-entities. But in w_2 they are 1.1 m apart and so L does not apply to **a** and **b**, and so nothing in w_2 is M. But if nothing is M, then according to Armstrong M does not exist and so neither does L. While we can understand that the 20 cm difference in location of **a** between w_1 and w_2 may make a difference to what happens to **a** it is implausible that it makes a difference to which laws there are. Consideration of such a case lends support to Shoemaker's contention that universals concern ways things could be not merely the way any things actually are.

The spatial version of this argument is to all intents and purposes the same as Charlie Martin's example of the non-interacting particles (Armstrong et al. 1996, p. 74) and a similar case discussed by Michael Tooley (Tooley 1977, p. 669). Armstrongs' reply to Martin and Tooley, adapted to this case, states that there need not be any counterfactual fact of the matter, regarding w_2, as to what would have happened had **a** and **b** been 20 cm closer together. Armstrong does not explain why we should believe this, except to argue that the view is not absurd, by analogy with a case of an irreducibly probabilistic event, such as a nuclear decay. In the latter case we cannot say that either 'had the particle been excited, it would have decayed' nor can we say 'had the particle been excited, it would not have decayed'. Even if we allow Armstrong's position to be coherent, it gives us no reason for saying that as regards w_2 *it must be false* that had **a** been 20 cm closer to **b**, **a** and **b** would have been M, which is what Armstrong's instantiation condition requires us to say.

Armstrong officially regards universals as part of the furniture of the universe. He rejects nominalist views that take only particulars to exist. But the instantiation condition seems to be a failure of nerve in this realism about universals. If universals really are entities in their own right, why should their existence depend upon a relationship with existing particulars? A diagnosis of the failure of nerve is this. Armstrong's metaphysics takes universals to be *categorical* properties. That is, he denies the dispositional essentialism espoused in this paper. Universals do not have their causal powers essentially, but instead they have them contingently. All that can be said about the essence of a categorical property is that it is identical with itself and distinct from other things. It may be that Armstrong fears that such an entity is too spectre-thin to

really exist without the backing of something else more substantial. (Recall that Armstrong's reading of the Eleatic Principle took the quantifier 'anything' to range over particulars but not universals.) So for Armstrong, it is the instantiation of the property in a particular that gives it the required backbone. This is a speculative diagnosis. If it is correct it is of course a motivation that cannot apply to the dispositional essentialist view of universals. According to that view universals do have a contentful essence, their dispositional powers.

Strong necessitarianism with instantiated properties

In this section I wish to explore the combination of strong necessitarianism *with* Armstrong's instantiation condition. One reason for looking at this view is that it is the prima facie least plausible version of the strong necessitarian view. Indeed to many it may look to be in danger of being inconsistent. The combination requires that every possible property is not only actual but is also instantiated. The following ('toy') example might suggest this.[10] Let us assume for convenience that all laws are generalisations. One possible law says 'all grass is green' and another says 'all grass is red'. Since these are both possible they are both laws. The two generalisations can both be true without generating any contradiction – but only so long as there is no grass. But if every property is instantiated there will be some grass, and that grass will be both green and red. So it looks as if the instantiation condition leads to a contradiction in a way that strong necessitarianism without that condition does not.

   The necessitarian answer is simple. In such a case at most only one of 'all grass is green' and 'all grass is red' is a law. The ambitious dispositional essentialist holds that all laws are consequences of the essences of properties. Let us say then that it is a law that all grass is green. This will be because the essence of the property, being grass, involves the disposition to be green in normal conditions.[11] In which case that essence will not involve a dispo-

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[10]   The illustrative example is a toy example because it is unclear that the relevant properties (being grass, being green etc.) are genuinely sparse. And they certainly are not fundamental. So 'grass', green' etc. are standing in for genuinely sparse and fundamental properties.
[11]   We presume that the stimulus is a standing condition (see footnote 5 above), and that this standing stimulus condition is the same stimulus for all the dispositions discussed

sition to be red. Since laws follow from the essences of properties, and since the property of being grass does not involve the disposition to be red, there will be no law that all grass is red. If we regard the dispositional essences as determining the identities of properties, then if X and Y have distinct essences, X ≠ Y. So if the essence of grass involves the disposition to be green, then any property that involves the disposition to be red cannot be the property of being grass. The thought that both generalisations could be laws arises only for those still in the grip of the contingentist view of laws and the categoricalist view of properties that goes with it. On those views any property might be involved in a law with any other property. Clearly then the instantiation of all possible laws is impossible, for just the reason considered, that grass would be both green and red. But the dispositionalist denies that a property can be involved in just any law with any other property.

This response shows how to block a parallel but slightly more subtle objection to strong necessitarianism in general (even without the instantiation condition). With instantiation 'all grass is green' and 'all grass is red' lead to a contradiction. Without instantiation these generalisations are consistent (they are both vacuously true). But the *laws* that grass is green and that grass is red are *not* consistent. This is because laws entail counterfactuals. In this case we would have the inconsistent counterfactuals, 'if there were grass, it would be green' and 'if there were grass, it would be red' (which are inconsistent if the existence of grass is possible). The answer is just the same. It is not the case on the necessitarian view that both 'grass is green' and 'grass is red' can be laws.

A different objection to strong necessitarianism with instantiation goes as follows. 'One might imagine that the actual world contains more laws than we think, perhaps even all possible laws, so long as they are uninstantiated. Being uninstantiated they would be inert and would have no impact upon us. But if they were instantiated they would impact upon us. If all the possible laws were actual and instantiated, they would be doing things to existing entities and we would expect to be able to detect them.

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in this example. What is being said is that this dispositional essence of P cannot involve both $D_{(S,M)}$ and $D_{(S,\neg M)}$. However, if complex essences are permitted, then P might well have an essence involving both $D_{(S,M)}$ and $D_{(S^*,\neg M)}$, so long as S and S* are incompatible stimuli. Such essences will not lead to inconsistent laws.

But we do not detect them. The laws we do know about (even if only partly, at the most fundamental level) seem to be only a subset of all the possible laws. And so strong necessitarianism with instantiation looks to be in conflict with the empirical evidence.'

The key move in this argument is the sentence 'But if they were instantiated they would impact upon us,' amplified in the one following it, 'If all the possible laws were actual and instantiated, they would be doing things to existing entities and we would expect to be able to detect them.' There is no reason to suppose that these claims are true. Laws form integrated, systematic sets. This much is widely acknowledged and even forms part of the analysis of law on the Ramsey-Lewis view. In the dispositionalist picture, integration occurs because the manifestation property of one disposition may be the stimulus property of another, and so on. This may go round in a full circle. A simple case will be when we have two properties. For example, gravitational mass may be regarded as the disposition to transform space-time while space-time is the disposition to affect the motion of gravitational masses (although in this case it is probable that these dispositions reflect a deeper system of integrated fundamental dispositions upon which other dispositions supervene).[12] So all the possible laws will divide up into discrete sets (possibly singleton sets) such that each member of the set integrates with other members of the set but not with any laws outside the set. Take any entity. The existence and nature of that entity are determined by the laws that govern it. For example a water molecule exists and is what it is thanks to the laws of quantum mechanics. Those laws not only determine the existence and nature of the molecule's atomic and subatomic parts but also explain the existence of the molecule itself, by explaining the ability of oxygen and hydrogen to bond together; and in turn thanks to the details of that bond, the laws of quantum mechanics also explain water's properties (such as its ability to dissolve salt). So our entity, whatever it is, will have its existence and nature associated with some set of systematically integrated laws but, because they are discrete, not with any other. So entities associated with distinct sets of laws will not interact; they will be causally isolated from one another. Now consider that we as observers are just a certain kind of complex entity governed by

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[12] This circularity may itself seem to be problematic for dispositionalism. I shall not address that issue here – see (Holton 1999) for an explanation of why it need not be problematic.

one of the sets of laws. From what has just been argued, we could not interact with and so could not detect any entity governed by a different set of laws. So it is not true that should laws from a distinct set be instantiated, we might expect to detect such laws and the entities instantiating them. Indeed we know we could not detect them.

Evaluating strong necessitarianism

In this paper I have sought primarily to show that strong necessitarianism is a consistent position. Are there however reasons to think that strong necessitarianism is true – or is false? The strongest reason for thinking that the view is false is the force of intuition. We have a strong intuition that the laws of nature are contingent and a strong intuition that the existence of sparse properties is contingent also. In the next section I shall briefly mention why I do not think that the force of intuition provides a strong objection. Note that the intuition that laws are contingent counts just as much against weak necessitarianism as against strong necessitarianism. So only the intuition that the existence of sparse properties is contingent acts against strong necessitarianism specifically. But that intuition does not seem to me to be any stronger or better founded than the former. In which case, if one is willing to swallow one's intuitions to the degree of going along with necessitarianism at all, intuition should not itself be allowed to incline one towards the weaker version rather than the stronger.

What reasons might incline one towards the stronger view? Above we came across Shoemaker's view that properties could be regarded as ways things can be. If we regard this 'can' as metaphysical rather than nomic, then the way a thing can be is something that will be shared by all possible worlds, assuming S5. (The conception of properties as ways things can be is consistent with dispositional essentialism. The latter adds that for a thing to be a particular way is for it to be disposed to behave in a certain way.)

The strong necessitarian view has an advantage over its competitors in the realm of explanation. Laws and causal powers are essential components of explanations. Sometimes we are able to explain a law or power by showing it to be a consequence of some set of deeper laws or powers. That invites an explanation of those

deeper laws and powers. A regress threatens that leads either to an infinite chain of laws or powers or, more likely, to a fundamental set of laws or powers that cannot themselves be explained. Some have regarded this as a reason to think that the very idea of explanation is an illusion. This is a fallacy; it is not a necessary condition on A's explaining B that we have an explanation for A also. Nonetheless one may be sympathetic with the thought that one's chain of explanations is less satisfactory for lacking an explanation of A, and even more so when told that can be no explanation of A, since A is fundamental. There is an explanatory lacuna if although the basic set of laws and powers could have been otherwise (as the contingentist holds), there is no explanation of their being as they are; that being fundamental we just have to accept the brute and accidental fact that they are as they are and not otherwise.

If one is sympathetic to that thought, then strong necessitarianism provides a balm. Strong necessitarianism cannot provide an explanation of the same kind for the fundamental laws, since there are no yet deeper or more general laws to explain these. But it can provide an explanation of sorts. Being necessary, the fundamental laws could not have been otherwise. Viewed one way we cannot ask for an explanation of the usual kind at all, for the comparative question, 'why do we have these laws as opposed to some other set?', assumes what is false, that some other set is possible. Viewed another way, the strong necessitarian provides an explanation that is the best possible. A natural way to understand what Hempel sought in his Deductive-Nomological model of explanation was that he wanted to make precise the thought that a fully satisfactory explanation shows why, given laws and antecedent conditions, the explanandum *had* to be. Where the explanandum is itself a law, antecedent conditions play no role, and so to explain a law is to show how it had to be, given other laws, i.e. to explain L1 one shows that $\Box(L2 \rightarrow L1)$ where L2 is another law or set of laws. By this standard, to show that a law had to be, *whatever* other laws or conditions might be, is an explanation also, indeed as good an explanation as one could hope for. That is, if a demonstration of $\Box(L2 \rightarrow L1)$ provides an explanation of L1, then so does a demonstration of $\Box(L1)$.[13]

[13] Armstrong (1983, p. 159) records that Martin Tweedale suggests a Rationalist-style argument based on the Principle of Sufficient Reason, in favour of necessitarianism, that is along the same lines as the proposal I put forward here. Armstrong objects that short of adopting a philosophy of the Absolute (the one sole reality from which all the

Imagination and possibility

The main objection to necessitarianism, whether strong or weak, is that it conflicts with our intuitions that laws are contingent. In this section I will very briefly indicate the line of thought I advocate in response to this objection. We know already that our intuitions concerning necessity are unreliable. Frege believed, in tune with intuition, that identity is contingent. But as Kripke has shown us this is a mistake. The fallibility of intuitions of contingency is not limited to identity. It can also be shown that some very contingent looking laws of nature are necessary – without assuming anything like necessitarianism (Bird 2001). Necessitarianism simply claims that the illusion of contingency is more widespread. The source of the illusion is primarily the existence of (genuine) epistemic contingency – propositions whose truth (or falsity) is not deducible from what we know. A related source is the association we make between possibility and imaginability. That imaginability is no guarantee of possibility needs no emphasizing. But a question is raised over why one ever thought there is a connection.

The following is a hypothesis about such a connection. Simple creatures react simply to their environment as they find it. Only what is actual has any effect on them. Where those creatures have perceptual capacities, the effect of actuality is via perceptual representations of actuality. More sophisticated creatures need to think about possibility also: the possibility that either prey or a predator is hidden in the bushes, for example. One may hypothesize that consideration of possibilities and their role in influencing behaviour might be similar to, though weaker than, the manner in which actuality influences behaviour, that is, via perception-like representational states. This hypothesis would explain why it is natural to think of imaginability as a guide to possibility, and why it would be correct to think so to some extent. But the hypothesis gives us no reason to think that imaginability should be an infallible guide. On the one hand imaginability is limited by representational capacities, so many possibilities will not be captured by the imagination. But this failure does not harm the adaptive benefit of imagination, since the possibilities

phenomena may be deduced), one will be forced to adopt contingency in our explanations at some point. I am not sure why Armstrong says this. Perhaps the Strong Necessitarian conception of the laws makes them equivalent to the Absolute.

knowledge of which are relevant to a creature's fitness (the possibility of a predator in the bushes) are ones that a cognitively well-adapted creature typically does have the capacity to represent. The unimaginable possibilities are often too remote to have an influence on a creature's fitness. In the other direction, more relevant to present concerns, the imagination will represent as possible situations that are not possible. This failure could well have an influence on a creature's fitness, since false positives (such as erroneous beliefs that there it is possible that there is prey to be found in the bushes or that a predator is near the watering hole) can have a deleterious impact. Even so, one should not expect adaptive capacities to be perfect, just to be better than nearby alternatives.

An imaginative capacity that is more accurate with respect to possibility would require an adaptation that would prevent us from representing as possible an identity that is in fact necessarily false. It does not seem that any simple improvement to human powers of imagination could do this, since it seems imagination (as employed in this context) is intensional rather than extensional. That is, how could one adapt the imagination so that it did not present Lois Lane with a picture, for example, of Clark Kent in one place and Superman in another place? Furthermore, even if an adaptation could occur that permits its possessor to see that alternative *laws* governing the same properties are not possible, there is no selection pressure that would bring such an adaptation into existence. For in so far as a creature's fitness requires a concern with laws (via a concern with causation), it can only ever be concerned with the laws we actually have (and impact upon it); whatever else is or is not possible is adaptively irrelevant.[14]

And so if the hypothesis is correct, that the link between imagination and possibility is explained by the adaptive benefits of such a link, we would have no reason to suppose that such a link should be reliable in delivering accurate judgments when applied to esoteric cases such as the contingency or necessity of laws. The functions of intuition, imagination, and common-sense are to guide us through the near-at-hand world of middle-sized dry

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[14]   Of course, I think we do have an adaptation that allows us to know the impossibility of the relevant propositions. But this adaptation, reason, goes well beyond the power of imagination. And the power of reason seem to be a power that extends beyond the adaptive pressures that gave rise to it.

goods, variability among which does affect our lives. We should not expect it to have much utility when faced with the science of the very small or very large (where it also fails us) nor with metaphysical questions.

Conclusion

Dispositional essentialism, a plausible view about the natures of (sparse or natural) properties, yields a satisfying explanation of the nature of laws also. The resulting necessitarian conception of laws comes in a weaker version, which allows differences between possible worlds as regards which laws hold in those worlds and a stronger version that does not. The main aim of this paper has been to articulate what is involved in accepting the stronger version, most especially the consequence that all possible properties exist in all worlds. I have also suggested that there is no particularly persuasive reason for preferring the weaker to the stronger version. For example, Armstrong's instantiation condition on universals entails that according to strong necessitarianism every property is instantiated in all possible worlds. But first we do not need to accept Armstrong's instantiation condition, in part because his arguments for it are forceful only for a contingentist about laws and properties. Secondly, even if we did accept the condition, the consequence that all properties are instantiated is not itself contradictory, so long as any form of necessitarianism holds. Strong necessitarianism is *prima facie* counter-intuitive. But for that matter so is weak necessitarianism. Accepting either weak or strong necessitarianism requires denying the force of intuition in this area, as indeed we have every reason to do.

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