Can Primitive Laws Explain?

Tyler Hildebrand
University of Washington

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0 Abstract
One reason to posit governing laws is to explain the uniformity of nature. Explanatory power can be purchased by accepting new primitives, and scientists invoke laws in their explanations without providing any supporting metaphysics. For these reasons, one might suspect that we can treat laws as wholly unanalyzable primitives. (John Carroll's *Laws of Nature* (1994) and Tim Maudlin's *The Metaphysics Within Physics* (2007) offer recent defenses of primitivism about laws.) Whatever defects primitive laws might have, explanatory weakness should not be one of them. However, in this essay I’ll argue that wholly primitive laws cannot explain the uniformity of nature. The basic argument is based on the following idea: though a primitive law that P makes P likely, the primitive status of the law provides no reason to think that P must describe (or otherwise give rise to) a natural regularity. After identifying the problem for primitive laws, I consider an extension of the objection to all theories of governing laws and suggest that it may be avoided by a version of the Dretske/Tooley/Armstrong theory according to which laws are relations between universals.

1 Introduction
Suppose that the physical world consists of a mosaic of local matters of particular fact — local natural properties standing in external spatiotemporal relations. Are there any restrictions on the ways in which natural properties are distributed in the world's mosaic — any reason why the mosaic exhibits the regularities it does? Different answers to this question constitute different theories of laws of nature.

*Humeanism* denies that there are governing laws of nature, bare dispositions, or any other natural necessities that place restrictions on the ways in which properties are distributed in the mosaic.¹ Thus it accepts a recombination principle according to which any logically consistent distribution of natural properties is possible. If Humeanism is true,...

¹. Humeanism is broader than *Humean supervenience*, the view that accepts Humeanism and, in addition, holds that there is nothing other than the world’s mosaic. See (Lewis 1986, ix–x), from which my initial discussion of the mosaic is inspired.
there may be nothing deserving to be called laws (van Fraassen 1989), or it may be that laws reduce to or supervene on the mosaic (Lewis 1973 and 1994; Loewer 1996; Earman and Roberts 2005a,b; Beebee 2000, 2006, and 2011; Schaffer 2008).

_Essentialism_ holds that something _within_ the mosaic places restrictions on the distributions of properties in the mosaic. How might this work? The properties themselves could involve some sort of natural necessity; for example, some properties might be essentially (or at least intrinsically) dispositional (Ellis 2001; Mumford 2004; Bird 2007). On this view, the distribution of properties in the mosaic is determined by the intrinsic natures of the properties themselves. Properties within the mosaic do the required explanatory work, so there appears to be no need to postulate theoretical entities outside the mosaic. I’ll ignore Essentialism in this paper, but much of what I say about competing versions of the next view may hold for analogous versions of Essentialism.

_Governing Laws_ holds that there is something — namely, the governing laws — _outside_ of the mosaic that places restrictions on the distributions of properties in the mosaic. For example, a governing law might require that all Fs are Gs even though there is nothing intrinsic to properties F and G in virtue of which this regularity holds. What is the intrinsic nature of governing laws? They could be relations between universals (Armstrong 1983; Dretske 1977; Tooley 1977 and 1987), preferences in the mind of God (Foster 2004), or unanalyzable primitives (Carroll 1994; Maudlin 2007), to name a few.

My interest in this essay is with the intrinsic nature of governing laws. I’ll assume that we have a good grasp of the concept of an ontological primitive. My question is whether we should treat governing laws as primitives, or whether we ought to analyze them in terms of other primitives. Specifically, my concern is with the following two versions of Governing Laws:

*Primitive Governing Laws (PGL):* There is some ontological

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primitive outside of the mosaic that restricts distributions of properties in the mosaic.

_Analyzable Governing Laws (AGL):* There is something analyzable outside of the mosaic that restricts distributions of properties in the mosaic.

Dretske (1977), Tooley (1977; 1987), and Armstrong (1983) are recent proponents of _AGL_. Carroll (1994) and Maudlin (2007) are recent proponents of _PGL_ (or narrower versions of it, anyway). For example, Maudlin says,

> My analysis of laws is no analysis at all. Rather, I suggest we accept laws as fundamental entities in our ontology. Or, speaking at the conceptual level, the concept of a law cannot be reduced to other more primitive notions. (Maudlin 2007, 18)

On the conceptual level, then, we can distinguish _AGL_ and _PGL_ by their treatment of _statements_ of laws. In its general form, _PGL_ holds that the locution ‘It is a law that’ has a wholly primitive status corresponding to the ontological primitives capable of satisfying it. According to _AGL_, the locution can be translated into different statements containing different primitive terms. For example, one who thinks of laws as relations between universals can translate ‘It is a law that all Fs are Gs’ into ‘Universal F stands in the relation of nomic necessitation to universal G’ (or something similar). In this analysis, the concept of lawhood

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2. I describe their version of _AGL_ in Section 4.

3. I am not inclined to treat Lange (2009) as a proponent of _PGL_ — he analyses laws in terms of primitive subjunctives — but I think my objection to _PGL_ will apply equally to his view. This is worth mentioning, because Lange is sometimes classified alongside Carroll and Maudlin as an ‘anti-reductionist’ about laws. See Section 6 of John Carroll’s (2012) ‘Laws of Nature’ in the *Stanford Encyclopedia of Philosophy*.  

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is analyzed in terms of the supposedly more primitive concepts of universals and nomic necessitation.

One might worry that there is something wrong with PGL simply because laws are unsuitable primitives. I am not interested in this concern here. As Maudlin says:

Taking laws as primitive may appear to be simple surrender in the face of a philosophical puzzle. But every account must have primitives. The account must be judged on the clarity of the inferences that the primitives warrant and on the degree of systematization they reveal among our pre-analytic inferences. (Maudlin 2007, 15)

In this essay I’ll judge PGL and AGL by these criteria. Specifically, I’ll be concerned with the inferences these theories warrant with respect to the distribution of natural properties in the world’s mosaic.

At this point, it will be helpful to say a little more about that distribution. I believe that our mosaic exhibits natural uniformity. This is to say that all particular matters of fact participate in natural regularities, patterns in the distribution of properties in the mosaic. I’ll simply assume (a) that natural regularities are objective and (b) that not all possible distributions of natural properties exhibit natural regularities. For example, we might conceive of regularities as patterns described by universal generalizations relating distinct natural properties; in this case (a) and (b) follow straightforwardly. These assumptions — i.e., (a) and (b) — may be controversial, but I believe that they will be accepted by those who think that observed regularities are the kinds of observations for which we should like to have an explanation. Thus the fundamental question of this essay is this: are all versions of Governing Laws equally well suited to explain the uniformity of nature?

Ultimately, it would be nice to determine which theory of laws offers the best explanation of natural uniformity. I can’t do that in this essay. However, I can argue that PGL fails to offer a better explanation than Humeanism, and further that a certain version of AGL promises a better explanation of natural uniformity than both Humeanism and PGL. This is a serious problem for PGL, because Humeanism is widely regarded as offering a poor explanation of natural uniformity. I’ll provide a quick defense of this view in the next section, but the interested reader should consult (Foster 1983), (Fales 1990, Chapter 4), and (Bird 2007, 86–90) for more thorough defenses.

In what sense can one theory offer a better explanation than another? There are two main respects. Crudely, we might call them probabilifying power and initial plausibility. These concepts can be defined in probabilistic terms. T1 has more probabilifying power over observation O than T2 if and only if \( P(O|T_1) > P(O|T_2) \). In less formal terms, the probabilifying power of a theory over an observation describes the degree to which the theory makes an observation likely. T1 has more initial plausibility than T2 if and only if \( P(T_1) > P(T_2) \). The following version of Bayes’ theorem tells us how to weight these respects, and it suggests that we can determine which of the two theories offers the better explanation without considering all other theories:

\[
\frac{P(T_1|O)}{P(T_2|O)} = \frac{P(O|T_1)P(T_1)}{P(O|T_2)P(T_2)}
\]

The relevant condition to be added is that T1 is a better explanation than T2 if and only if \( P(T_1|O) > P(T_2|O) \).

This may appear to be an overly simplified account of explanation. (It certainly isn’t intended to be an account of scientific explanation.) However, for present purposes the goal is merely to lend some precision to the concept of explanation employed in the following line of

4. On a more speculative note, I also suspect that these assumptions are required for any sort of realism (including Humean realism) about laws.

5. To be clear, I don’t expect that any philosophical theory of laws will explain why the laws have the precise content that they have — why the laws give rise to the regularities we observe as opposed to other regularities — however, some may be better suited than others to explain why laws are the kinds of things that give rise to natural regularities as opposed to natural irregularities.
reasoning: it is astonishing that the world is uniform; insofar as some theories can explain this uniformity and others cannot, we have reason to prefer the former to the latter. As long as one agrees that having the better balance of probabilifying power and initial plausibility is necessary for providing a better explanation — whether or not it is sufficient — that will be all that is required for my arguments in this essay. A related worry is that some proponents of PGL may not claim to offer an explanation of natural uniformity in the first place.6 However, if PGL can’t offer such an explanation and other accounts can — and indeed I’ll suggest that there are such other accounts — then we would still have an important objection to PGL. A further worry is that I inherit some general difficulties of probabilistic epistemology by using the tools above. I’ve chosen to state the argument in this form because it can be done precisely, but I’ll suggest a non-probabilistic reformulation of my argument in 6.2.

The remainder of this paper is organized as follows. In Section 2, I argue that Humeanism and PGL are on a par with respect to their explanatory power over natural uniformity. In Section 3, I describe a version of AGL that appears to have explanatory advantages over Humeanism and PGL. In Section 4, however, I extend the argument against PGL (from Section 2) to all versions of Governing Laws. In Section 5, I argue that the Dretske/Tooley/Armstrong theory of laws of nature can avoid this general argument. Section 6 considers some objections.

6. Carroll and Maudlin do claim that primitive laws explain natural uniformity in some sense. Carroll (2008, 76–77) explicitly endorses the idea that natural uniformity constitutes evidence for his brand of governing laws over Humeanism. (He endorses the idea with less confidence in (Carroll 1994, 108–109).) Maudlin (2007, 178) holds that there is a sense in which Humean laws cannot explain but non-Humean laws can. Granted, Maudlin does not think it enough of an advantage that we can infer by inference to the best explanation that non-Humean is more likely to be true than Humeanism. He explains his skepticism in (Maudlin 2007, 181). For what it’s worth, I’m more optimistic than Maudlin about our ability to judge the a priori merits of Humeanism and non-Humeanism.

2 The Explanatory Weakness of Primitive Governing Laws

In this section I first argue that PGL in its most general form is no better than Humeanism with respect to its probabilifying power over natural uniformity. I then consider narrower, restricted versions of PGL and argue that they fail to improve on the general version in terms of their overall explanatory power.

2.1 PGL in its general form

I’ll start by providing a quick sketch of the explanatory weakness of Humeanism. Given only the information that Humeanism is true, should we expect our world to be uniform? The answer is no, and the reason for this should be familiar to those who have studied the problem of induction. Uniformity seems unlikely in the absence of any necessary (probabilistic) restrictions guaranteeing (probabilifying) a uniform mosaic. Why? Humeanism simply takes the distribution of natural properties in the mosaic as a brute, primitive fact. This has two consequences. First, Humeanism allows no explanation of why we have this mosaic as opposed to another. If the fact that our mosaic has the distribution it does is taken as primitive then there can be nothing that explains why our mosaic obtains as opposed to another. (Note that this is not the same problem as justifying that we do in fact have one mosaic rather than another.) Effectively, then, it is simply a matter of chance that we have this mosaic. Second, to take the mosaic as primitive is to place no restrictions on possible mosaics; thus every logically consistent distribution of natural properties constitutes a possible Humean mosaic. And though Humeanism countenances many possible uniform mosaics, most are not uniform. This follows from the second consequence together with our ordinary understanding of natural uniformity (which is captured by assumptions (a) and (b) discussed in the introduction). In sum, we have a wide-ranging space of possible mosaics, most of which are non-uniform (second consequence), and no a priori reason to prefer one to another (first consequence).
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consequence). Thus the probability of uniformity given Humeanism, P(U|H), is low.7

(Of course I recognize that some Humeans may resist this thesis, but my purpose is not to offer a full defense of it here. Rather, I merely wish to highlight its essential features in order to show that it can be mirrored for the case of PGL. Anyway, I think that philosophers are drawn to non-Humean theories like Essentialism and Governing Laws primarily because they believe that uniformity is in need of explanation that Humeanism cannot provide.8 This essay is concerned with the views of these philosophers, not with Humeanism itself. Thus arguing that PGL can explain because Humeanism can explain would not provide a satisfying victory for the proponent of PGL.)

I believe that PGL suffers from a perfectly analogous problem. PGL takes laws as primitives. This has two immediate consequences. First, PGL allows no explanation of why we have the laws we do as opposed to other possible laws. If laws are wholly primitive, on what basis can we explain why we have one rather than another? (Note that this is not the same problem as justifying that we do in fact have one law rather than another.) Second, PGL places no restrictions on the content of laws, so laws could give rise to every logically consistent distribution of natural properties. This is the key claim. To elaborate, it will be convenient to identify PGL with the view that the location ‘It is a law that’ is a primitive locution — a primitive operator of sorts — corresponding to the relevant ontologically primitive laws. Nothing hinges on this, but it allows for an intuitive statement of the following argument.

Consider the statement ‘It is a law that P’. Because PGL treats the locution ‘It is a law that’ as wholly primitive, there are no restrictions on what kind of statement P is. P can be anything. For instance, P could simply be a statement about a certain precise, irregular distribution of natural properties in the world. Thus for any description S of a possible mosaic, no matter how irregular, ‘It is a law that S obtains’ is a perfectly legitimate statement of law according to PGL. Thus primitive laws need not explain any regularities at all. Since there seem to be more non-uniform mosaics than uniform ones, it would similarly appear that there are more primitive laws giving rise to non-uniform mosaics than uniform ones. In sum, we have a wide-ranging space of possible laws, most of which give rise to non-uniform mosaics (second consequence), and no a priori reason to prefer one set of laws to another (first consequence). Like Humeanism, the ontology of PGL doesn’t do anything to make the vast array of non-uniform mosaics improbable, because it doesn’t do anything to make laws giving rise to regularities more probable than laws giving rise to irregularities. Thus the probability of uniformity given PGL, P(U|PGL), is low.

It might be objected that PGL and Humeanism are not parallel: there are more ways to describe uniform mosaics than non-uniform mosaics, so the second consequence is not as bad for PGL as it is for Humeanism. This means that there are more possible primitive laws giving rise to regularities than Humean laws giving rise to regularities (or Humean mosaics involving regularities). For example, suppose we begin with the set of Humean mosaics, each of which is described uniquely by a statement S, and a set of primitive laws isomorphic to the Humean mosaics, such that there is a mosaic satisfying S in the first set iff there is a law that S in the second. Now consider statements of the form all Fs are Gs. The Humean doesn’t describe a new mosaic by asking us to consider a mosaic in which all Fs are Gs. But the proponent of PGL does describe a new possible law simply by prefixing that statement with the ‘It is a law that’ operator. Thus, in addition to all statements describing the particular facts in a given mosaic, there are also statements describing general facts about mosaics. And though PGL doesn’t rule out the statements describing wholly irregular mosaics, its allowance of law statements involving generalizations does

7. Motivated by the first consequence, I’m implicitly assuming an objective method of assigning probabilities based on a principle of indifference. I’ll return to this assumption in Section 6.

8. One way to deny that Humeanism is in need of explanation is to reject my assumptions (a) and (b) about uniformity. Notice, however, that this would not completely eliminate the problem. We might still wonder why we were left with this mosaic as opposed to another. And Humeanism cannot explain that. The same result holds for PGL.
suggest that uniformity is more likely than it would have been if we did not allow law statements involving generalizations.

Unfortunately, this strategy doesn’t work. Remember, P can be absolutely anything, including general statements involving gruesome predicates. Gruesome predicates allow us to describe vastly irregular mosaics by way of very simple generalizations. Provided that we are willing to take certain liberties in defining our predicates, generalized statements of laws that give rise to non-uniform mosaics can be multiplied without limit. If the laws are wholly primitive, there is no reason not to take these liberties — no reason to rule out law statements involving gruesome predicates. Thus the conclusion above is unaffected. According to PGL it is effectively a matter of chance which laws we get, and there is no reason to suppose that the ratio of non-uniform possibilities to uniform possibilities is any different for PGL than it is for Humeanism.

The moral of the story: We need to place at least some restrictions on the kind of statement suitable to replace P in ‘It is a law that P’. Otherwise, primitive laws do nothing to make natural uniformity at all likely — or, at any rate, more likely than if Humeanism were true.

2.2 Narrower versions of PGL

Can the proponent of PGL just stipulate that primitive laws obey the relevant restrictions? For example, could we simply stipulate that law statements must be universal generalizations involving natural properties — that ‘It is a law that’ is a primitive operator that attaches only to statements of the relevant form? Why not? It’s our operator, and we can make it behave however we like. Carroll (1994, 21–27) and Maudlin (2007) employ this strategy, though they focus on slightly different features of laws. Carroll (1994, 21–22) holds that primitive law statements are true, general or universal, and contingent. Maudlin (2007, 10–15) holds that primitive laws describe how physical states evolve over time, but they needn’t be universal. (He calls them fundamental laws of temporal evolution.) For both philosophers, the laws themselves are ontological primitives: laws satisfy the constraints just mentioned, but their satisfaction of these constraints is taken as primitive; no further development of the ontology of laws is permitted.

For our purposes it will not matter which set of restrictions we consider, so I’ll just focus on the restriction that law statements are universal generalizations involving natural properties. There may be good empirical reasons to think that laws have this feature (or Carroll’s or Maudlin’s preferred features). The question is whether a metaphysical theory of laws can make sense of them. From the perspective of Humeanism or PGL, the suggestion on offer amounts to an ontologically ungrounded restriction on what kind of proposition is suitable for P. It simply stipulates that the operator ‘It is a law that’ attaches only to propositions P satisfying the relevant constraints. It does not follow from any underlying analysis of laws; the restriction isn’t grounded in any supporting metaphysics. The worry I wish to develop is that, because it is ungrounded in this way, this strategy acquires probabilifying power for its laws only by trading away their initial plausibility. Exactly parallel arguments apply to the restrictions employed by Carroll and Maudlin.

Once again, let’s first consider Humeanism. Suppose the Humean places the following restriction on laws: law statements must be universal generalizations describing relations among natural properties. Suppose we are given the information that our world contains Humean laws. Given that information, how likely is it that our world has some degree of uniformity? Very likely! Humean laws have great probabilifying power over regularities. But this is no victory for the Humean. For the Humean, laws are identified with natural regularities; laws just are the regularities themselves. This means that the initial plausibility of a given law is exactly the initial plausibility of its corresponding regularity.9 (This is why no regularity explains itself.) Generalizing, the Humean has gained probabilifying power only by trading equal

9. This equivalence breaks down on Hume analyses of laws that allow a regularity to be lawlike in some worlds but not others. However, this breakdown has no effect on my arguments.
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amounts of initial plausibility. Humean laws make natural regularities probable, but Humean laws themselves are so improbable — namely, as improbable as that the natural regularities they describe would occur by chance — that no explanatory gains are achieved.

The problem may be stated more precisely as follows. $P(U|H)$ is low. However, there is a narrower version of Humeanism, $H^*$, according to which $P(U|H^*)$ is high. Thus $H^*$ has plenty of probabilifying power over $U$. Unfortunately, the probabilifying power of $H^*$ is offset by its very low initial plausibility, such that $P(U|H^*)P(H^*) = P(U|H)P(H)$. In short, $H^*$ fails to explain natural uniformity any better than Humeanism.

The situation is essentially the same for PGL: ungrounded restrictions do not allow primitive laws to explain natural uniformity, because the laws with probabilifying power over natural regularities are themselves are very improbable — namely, they are just as improbable as that the regularities would occur by chance. Consider:

*Primitive Governing Laws* ($PGL^*$): There is some ontological primitive outside of the mosaic that restricts distributions of properties in the mosaic such that the mosaic must be uniform.

The only difference between PGL and $PGL^*$ is that the latter explicitly states that laws give rise to uniformity, whereas the former does not. $PGL^*$ is a narrow version of PGL, but it isn’t narrower because it includes additional ontological primitives or because it involves a different analysis of the laws themselves. The only difference appears to be semantic: $PGL^*$ doesn’t label something a law unless it gives rise to natural regularities. This kind of strategy didn’t help the Humean precisely because there are no ontological differences between different Humean analyses of laws. The same problem holds here. There are no serious ontological differences between PGL and $PGL^*$, so the latter doesn’t explain any better than the former. The explanatory gains of $PGL^*$ over PGL are obtained only by forfeiting equal amounts of initial plausibility, because $PGL^*$ itself is just as unlikely as that the natural uniformity it probabilifies would occur by chance.

If it isn’t obvious why this is so, I invite the reader to consider the myriad of competing possible restrictions that could be placed on laws by the proponent of PGL. While $PGL^*$ seems a natural restriction, no ontological basis has been provided for thinking that necessary connections in nature should satisfy $PGL^*$ instead of some deviant, non-uniformity-producing version of PGL. $PGL^*$ is but one of very many hypotheses compatible with PGL, and its failure to include any ontologically distinguishing features means that there is no basis for assigning it a higher initial plausibility than any of its competitors. One such competitor might be the thesis that there are primitive *schmlaws*, ontological primitives that give rise to highly irregular mosaics. What the proponent of $PGL^*$ needs, but cannot provide, is some a priori basis to prefer primitive laws to primitive *schmlaws*. Their primitive status rules out any such reason. (Beebee (2011) makes a similar point in the course of objecting to necessitarian solutions to the problem of induction.)

To recap: In the subsection above I argued that $P(U|PGL)$ is low. $PGL^*$ is a narrow version of PGL according to which $P(U|PGL^*)$ is high. However, the explanatory gains of $PGL^*$ over PGL are offset by the very low initial plausibility of $PGL^*$. More precisely, the above arguments show that $P(U|PGL)P(PGL) = P(U|PGL^*)P(PGL^*)$. Thus $PGL^*$ fails to offer a better explanation of uniformity than PGL. If we assume that $P(H) = P(PGL)$, it follows that $P(U|H)P(H) = P(U|PGL^*)P(PGL^*)$. Thus $PGL^*$ fails to offer a better explanation of uniformity than Humeanism. This line of reasoning is repeatable for any set of ontologically ungrounded restrictions on the content of primitive laws, including those employed by Carroll and Maudlin. Therefore, primitive laws cannot explain the uniformity of nature.

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10. This is a reasonable dialectical assumption, because PGL is supposed to have empirical advantages over Humeanism.
3 The Alternative: Analyzable Governing Laws
Suppose that the argument above is sound. One might worry that it extends to all versions of Governing Laws (and perhaps to all non-Humean theories, though I won’t explore this matter here). In this section I’ll sketch a preliminary response to this worry by considering a popular version of AGL. This sketch will allow for the worry to be developed into a careful argument that no version of Governing Laws can explain natural uniformity. I provide that argument in the next section.

3.1 A sketch of the Dretske/Tooley/Armstrong theory of governing laws
The most well-known analysis of Governing Laws, due to Dretske (1977), Tooley (1977; 1987), and Armstrong (1983), holds that governing laws are irreducible second-order external relations between genuine universals. Call this theory DTA. Now consider the regularity that all Fs are Gs. We can explain this regularity by postulating a relation of nomic necessitation N between universals F and G, represented as N(F,G). The crucial postulate of the theory is

NN: For all F and G, N(F,G) necessitates the regularity that all Fs are Gs.

N is defined as the irreducible second-order relation that satisfies NN. NN entails that N(F,G) has probabilifying power over the regularity that all Fs are Gs. Since N(F,G) is a state of affairs outside of the mosaic that necessitates (and therefore has probabilifying power over) natural regularities, N(F,G) is a governing law.

Some philosophers have objected to the DTA theory on the grounds that the connection between governing law and regularity is problematic (van Fraassen 1989, Chapter 5; Bird 2005; Lewis 1983; Carroll 1994, Appendix A; Handfield 2005). These are important objections to the original versions of the DTA theory, because Dretske, Tooley, and Armstrong all attempt to downplay or minimize the introduction of new primitives in their accounts of laws. For example, a stated goal of (Tooley 1977) is to provide an analysis of nomological concepts in non-nomological terms. However, these objections are irrelevant to our purposes. If they succeed, they merely establish that N and other nomological relations must be ontological primitives. Given my assumptions in this essay, that doesn’t constitute an objection to AGL. Therefore, for present purposes it will be best to treat N as a primitive relation.11

3.2 A preliminary disanalogy
Can DTA explain uniformity better than Humeanism and PGL? As we saw above, one source of the problem for both Humeanism and PGL is that they lack the ontological resources to explain why certain statements P are suitable for substitution into ‘It is a law that P’ and others are not. They must simply stipulate that ‘It is a law that’ is restricted. Let’s focus on the idea that statements of laws are restricted to generalizations among natural properties. Can DTA explain these features of laws? Its purported ability to do so is fairly well known, so I will reproduce the explanations very quickly.12 Concerning the idea that laws are universal generalizations: universals are constant across space and time, so if a natural relation — it is important to note that natural relations are construed here as universals themselves — holds between universals at one place and one time, it holds between universals at all places and all times. If such a relation guarantees a corresponding regularity among its instances, different tokens of the relevant types will always and everywhere exhibit the same regularities. Concerning the idea that the relevant uniformities range over natural properties only: treating laws as relations among genuine universals guarantees that the regularities concern natural properties as opposed to gruesome properties. This is because, on this type of account, natural properties are demarcated from non-natural properties by the universals them-

11. Objection: N is an ontological primitive outside the mosaic that restricts distributions of properties in the mosaic, so N is a primitive law. Reply: N on its own does not so restrict; it is the instantiations of N that give rise to regularities; those instantiations are analyzable states of affairs.

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The first-order objection: This objection is so-called because it concerns the nature of the first-order properties bound by the quantifier in NN, restated here for the benefit of the reader:

NN: For all F and G, N(F,G) necessitates the regularity that all Fs are Gs.

What kind of properties are F and G? I mentioned above that we need to treat F and G as natural properties, as genuine universals. Laws relating gruesome properties would not result in genuine regularities (except in rare circumstances). Now distinguish two versions of DTA:

Unrestricted DTA: there are no restrictions on the first-order properties bound by the quantifier in NN.

Restricted DTA: the properties bound by the quantifier in NN must be natural properties (that is, genuine universals).

In the section above, my discussion of DTA was really a discussion of Restricted DTA. The objection proceeds as follows. Unrestricted DTA lacks probabilifying power over natural uniformity, since the properties standing in necessitation relations to one another can be anything, including gruesome properties. This view is on par with Humeanism and PGL, so we must move to the narrower Restricted DTA. But we cannot do that in a principled, ontologically grounded manner. N is an ontological primitive, and its primitive status thus provides no reason to restrict its relata to natural properties rather than gruesome properties. The move from Unrestricted DTA to Restricted DTA thus trades initial plausibility for probabilifying power in exactly the same way that the move from the PGL to PGL* trades initial plausibility for probabilifying power. The end result is that Restricted DTA fails to provide a better explanation of natural uniformity than Humeanism and PGL.

4 New Primitives, New Ad Hoc Restrictions

I have just suggested that DTA doesn’t require any ontologically ungrounded restrictions to explain why governing laws make natural regularities likely. I’ll now consider two objections to this account and suggest that these objections generalize to all theories of governing laws.14

13. As is common, I’m assuming that natural properties are sparse and that there are no disjunctive universals and no negative universals. It must be noted that this assumption plays an important role in the argument of this section. If there can be such universals, laws can relate gruesome properties. Accordingly, one way to argue that no laws of any kind can explain uniformity would be to argue for disjunctive and negative universals. I’ll say more about this type of problem in the next section.

14. I am greatly indebted to an anonymous referee from the Australasian Journal of Philosophy for suggesting this elegant way of presenting these objections. These objections are related to some of Beebee’s (2011) arguments that appeals to natural necessity are of no help in solving the problem of induction. The next section of this essay suggests a response to my objections that may constitute a response to Beebee’s arguments also, thereby reopening the door for necessitarian solutions to the problem of induction.
(This may be seen as a particularly pressing worry given that Armstrong (1983, 100–101) explicitly allows N to relate quasi-universals.)

It should be clear that a response to this objection cannot simply involve a different definition of N, or of DTA. What we need is some reason to think that Unrestricted DTA requires an untenable ontology — that there couldn’t be, or that it is unlikely that there would be, nomic relations satisfying Unrestricted DTA but not Restricted DTA.

The second-order objection: This objection is so-called because it concerns the nature of the primitive second-order relations posited to hold among universals. The relation of nomic necessitation, N, is one such primitive relation, but there might be others. For example, there could be a relation N₁ such that, whenever N₁(F,G,H) holds, the regularity ∀x(Fx → (Gx ∨ Hx)) holds; there could be a relation N₂ such that, whenever N₂(F,G,H,I) holds, the regularity that all objects with both F and G at one time acquire either H one hour later or I two hours later, provided that it is prior to the year 3000; and so on. From this point, the objection proceeds similarly to the first-order objection. The second-order objection is noteworthy because it shows that irregularities can arise from laws relating perfectly natural first-order universals. Again, it should be clear that a response to this objection cannot simply involve a different definition of N, or of DTA. We need some reason to think that N is ontologically privileged over N₁, N₂, and the like — that N is more likely to relate natural properties than N₁, N₂, and the like.

Both objections purport to show that the move from Unrestricted DTA to Restricted DTA does not confer any explanatory advantages. They are very similar, but there is a benefit of introducing both. It suggests that, regardless of the primitives one countenances in an analysis of Governing Laws, there is an objection analogous to the objection to PGL. Thus we have reason to suspect that no analysis of Governing Laws can explain the uniformity of nature. I view this as a formidable objection to Governing Laws. (And though I have not considered the matter here, I suspect that an analogous objection holds against essentialism.)

5 A Potentially Promising Response

Despite the appeal of the objection above, I have some optimism that it can be countered. This section explains my optimism, but that’s all. I can’t draw a stronger conclusion here, because that would require a thorough investigation of the metaphysics of natural properties — a large project best reserved for another paper. Thus I’ll simply aim to identify a potential disanalogy between the objections to PGL (namely, my argument in Section 2) and the objections to DTA (namely, those discussed in the section above). This disanalogy recommends a research program that, if successful, would preserve the overall explanatory power of Governing Laws.

Above, we saw that a response to the first- and second-order objections cannot be merely verbal. They cannot be countered simply by more carefully specifying the meaning of terms like ‘nomic necessitation’. We need to ground the response in genuine ontological differences. We need some reason to think that genuine nomic relations are more likely to relate natural properties than gruesome properties; we need some reason to think that a relation like N is more likely to obtain than relations like N₁ and N₂. Of course, if my arguments from Section 2 are to be maintained, the relevant reasons cannot be paralleled in support of PGL. This suggests that the relevant reasons must be based on independent investigations into the metaphysics of natural properties, since natural properties — more precisely, universals — play a role in DTA laws but not in primitive laws.

My suggestion for the proponent of Governing Laws is to defend the following line of reasoning. There just aren’t (weaker: it’s just a priori unlikely that there are) non-natural properties — not really, not fundamentally — by hypothesis, governing laws are objective, real/fundamental features of the world; therefore, since N is a real/fundamental relation (whereas N₁ and N₂ are not) relating real/fundamental properties, there is good independent reason to think that...
DTA laws will give rise to natural regularities. The first-order objection relies on the idea that there are non-natural properties, because the relata of nomic relations that give rise to irregularities are non-natural properties. The second-order objection relies on the idea that there are non-natural relations, because relations like $N_1$ and $N_2$ are non-natural. By distinguishing natural properties from non-natural properties and privileging the former over the latter, we can identify a genuine ontological difference between Unrestricted DTA and Restricted DTA, thus providing a reason to prefer the latter to the former, and so avoid both the first- and second-order objections. Unrestricted DTA countenances non-natural properties in its fundamental ontology; Restricted DTA does not. This is a reason to prefer Restricted DTA to Unrestricted DTA — that is, a reason to think that Restricted DTA has a higher initial plausibility than “deviant” irregularity-producing versions of Unrestricted DTA (or at least that the ratio of the initial plausibilities of Restricted DTA to Unrestricted DTA is higher than the ratio of the initial plausibilities of PGL* to PGL). Therefore, the move from Unrestricted DTA to Restricted DTA isn’t ungrounded, contrary to the assertion of both the first- and second-order objections above.16

My suggestion does require that we have independent reasons to accept both the concept of naturalness and the thesis that the real/fundamental properties are sparse natural properties. It also requires that N is more natural than $N_r$ etc. I can’t defend these theses here. (This is why I’m not claiming to have solved the problem in this essay.) I will note, however, that many philosophers take these theses very seriously, that both theses strike me as very plausible, and that I suspect they will be quite popular among those who are sympathetic to realism in metaphysics.17

On the surface, it might appear that this same response is available to the proponent of PGL. For example, perhaps the proponent of PGL could endorse a narrower theory perfectly analogous to Restricted DTA:

$$\text{Restricted PGL:} \text{For all natural properties F and G, the primitive law that all Fs are Gs necessitates the regularity that all Fs are Gs.}$$

Just as we can have principled reasons to prefer Restricted DTA to Unrestricted DTA, so we can have principled reasons to prefer Restricted PGL to PGL.

Unfortunately, this response fails. I have assumed all along that the properties in the mosaic are natural, yet it doesn’t seem correct to say that any given distribution of natural properties is more “natural” than another, at least not in the same sense of ‘natural’. (That’s not the same thing as saying that some distributions constitute regularities.) According to PGL, there is no reason to think that laws must be in the form of generalizations in the first place; therefore, though the simplest statement of a given law might involve gruesome predicates, there is no reason to think that such a law is less natural than one whose simplest statement involves only natural predicates. Both natural predicates and gruesome predicates can be used equally well to describe perfectly natural distributions of properties. We might have a preference for laws that are expressible as simple generalizations over natural properties, but if the laws are wholly primitive then there is no reason to think that the laws will match our preferences. Furthermore, since the laws are not some kind of higher-order relation, we can’t extend the line of reasoning in support of Restricted DTA to show that one primitive law is more natural than another. Thus laws according to Restricted PGL are not ontologically distinguishable from

16. If, like Armstrong, we do wish to countenance relations between quasi-universals — universals that are not perfectly natural or fundamental — as laws, there are options. We could allow for degrees of naturalness, and argue that laws can relate properties possessing an appropriate degree of naturalness. Alternatively, we could argue that the initial plausibility of there being a law relating a given property is proportional to the degree of naturalness or fundamentality of that given property.

17. The interested reader should consult (Sider 2012) for a good starting point.
laws according to PGL. Restricted PGL is simply a narrow version of PGL; in fact, it is exactly like the view PGL* that was considered and rejected in 2.2. The bottom line: The mere fact that the real/fundamental properties are natural properties doesn’t result in any ontological differences between PGL and PGL*.

Summing up, I have argued that those who accept the thesis that fundamental properties are natural properties (weaker: that the more natural a property is, the more likely it is to be instantiated) can provide an ontological basis to prefer Restricted DTA to Unrestricted DTA. The distinction between natural and non-natural properties is completely compatible with Humeanism, PGL, and DTA, but in the present context it only helps the proponent of DTA. There are independent arguments for the distinction itself and, furthermore, for thinking that fundamental reality involves natural properties and relations rather than non-natural ones. Though I have not considered these arguments, this suggests that my basic suggestion needn’t be an ungrounded stipulation. This allows for an argument that Restricted DTA is initially more plausible than Unrestricted DTA (or, at the very least, that the ratio of the initial plausibilities of Restricted DTA to Unrestricted DTA is greater than the ratios of the initial plausibilities of H* to Humeanism, PGL* to PGL). This is probably already accepted by the proponent of Restricted DTA anyway, since one of the best reasons to endorse universals is to explain what distinguishes natural classes from non-natural classes. For these reasons, I think that this suggestion offers a very promising model for defending the thesis that analyzable governing laws can explain. Analogous solutions are not available to either the Humean or to the proponent of PGL. 18

6 Objections

6.1 Assignments of probability are subjective

I have implicitly assumed that assignments of initial plausibility and probabilifying power are objective. Some will hold that some assignments must be subjective — or in fact that all assignments of prior probabilities are subjective. In this case one could reason as follows:

The author and I agree that a primitive law that P makes P likely. The author argued that this probabilifying power is gained only by trading initial plausibility, but I can assign this primitive law any initial plausibility I want! And, generally speaking, it just seems to me that primitive laws probabilifying uniform distributions of natural properties are more likely than primitive laws probabilifying non-uniform distributions of natural properties, so I assign the primitive laws capable of explaining uniformity high prior probabilities. Thus my laws offer a nice explanation of the uniformity of the natural world.

This response raises difficult issues, but I believe that it can be defeated by a simple line of reasoning.

On this subjective view, the laws are not responsible for the explanation of natural uniformity; rather, it is the assignment of priors, which proceeds independently from any considerations of the ontology of laws. (Remember, there are no intrinsic ontological differences between primitive laws that probabilify regularities and those that don’t.) However, if we can assign priors in this way, irrespective of ontological differences, we don’t need the laws to explain in the first place. We can just say that uniform distributions of natural properties are more likely than non-uniform distributions, end of story. (This seems to me to be a reductio of the view that subjective methods of assigning prior probabilities can be applied to these kinds of issues in the first place, but discussion of this idea goes beyond the scope of

18. I have argued that there are good reasons to move from Unrestricted DTA to Restricted DTA. But what about the move from AGL to DTA in the first place? How is that justified? As in the case of naturalness, I cannot offer a defense of this move, but I can briefly suggest that it is ontologically grounded in the appropriate way. First, the basic concept of a regularity may provide reason to think that laws involve properties. Second, there may be independent arguments for accepting universals as opposed to some other account of the what distinguishes natural from non-natural classes. If so, we have principled — that is, ontologically grounded — reasons to accept the move from AGL to DTA.
this essay.) Much of the motivation for positing primitive laws is lost if we accept this line of reasoning. We posit governing laws precisely because we think they can explain something in need of explanation, but if we can just say that the uniformity of nature is a priori probable then it isn’t in need of explanation. The force of this response is emphasized by noting that if it is available to the proponent of PGL then it is also available to the Humean. If the Humean can use this strategy to explain uniformity, much of the initial motivation for positing primitive laws is lost.

6.2 Normalizability (and other worries in probabilistic epistemology)
I have stated my arguments in probabilistic terms. This introduces complications that one might prefer to avoid. A particularly pressing worry is as follows.19 Neither the space of possible Humean mosaics nor the space of possible primitive laws is normalizable. Both spaces are infinite; neither space has an upper bound. There are difficulties in assigning probabilities for such sample spaces, so the objection is that probability simply doesn’t apply in the present context.20

Fortunately, I believe that we can reframe my argument in non-probabilistic terms. The arguments of Section 2 demonstrate an isomorphism between possible primitive laws and possible Humean mosaics. Whatever disadvantages there are to taking the Humean mosaic as primitive are disadvantages to taking laws as primitive. Both theories posit brute facts of the same structure, so it is hard to see how one could explain (in our sense) better than another. The obtaining of a primitive governing law that gives rise to natural regularities is just as bruteish as the obtaining of a Humean mosaic including those regularities. Thus we have no reason to think that primitive laws offer any explanatory benefits over Humean laws. However, we do have reason to think that DTA laws are not isomorphic to primitive laws. This is borne out by the ontological restrictions such laws place on the type of statements that can be translated into statements of laws. Thus we may defend the same basic arguments without settling certain difficult problems in probabilistic epistemology. We do remain committed to a principle that connects the relevant isomorphism of brute facts to equality of explanatory power. However, I think that such a principle appears sufficiently plausible that the burden is on the proponent of PGL (or anyone who claims to introduce primitives capable of explaining something) to deny it.

6.3 Primitive laws have further benefits
I have been concerned with a single desideratum for a theory of laws: that laws offer a good explanation of natural regularities. But surely there are others. For instance, both Carroll and Maudlin place special emphasis on the conceptual benefits of treating lawhood as basic. Carroll (1994, Chapter 1) argues for nomic centrality, the thesis that most concepts are either nomic or carry nomic commitments. Maudlin (2007, Chapter 1) argues that primitive laws offer a unified account of the concepts of (physical) possibilities, counterfactuals, and explanations. Finally, we might think that laws are more familiar than universals or relations of nomic necessitation; this makes laws more suitable as primitives.

I agree that these are benefits of treating lawhood as primitive. But the first two are benefits had equally by any theory of governing laws that countenances nomic primitives. The primitives introduced by DTA (namely, the primitive nomic necessitation/probabilification relations) can explain the centrality of nomic concepts and provide a unified account of the concepts of physical possibilities, counterfactuals, and explanations just as well as wholly primitive laws. This objection might succeed if DTA did not involve any new primitives — for example, if laws could be analyzed in terms acceptable to the Humean — but (as I am interpreting the view) it does involve new, explicitly nomic primitives. And that is enough to ground the relevant analyses.

19. I am greatly indebted to Neil A. Manson for providing this objection and suggesting a non-probabilistic framing of my argument.
20. Recent literature on the fine-tuning argument offers an explanation of these problems in a context very similar to this one. Manson (2009, 278–283) provides an accessible summary (and also a brief argument (2009, 281) that utilizes the essential idea that drives my arguments in Section 2. The following provide more thorough discussion: (McGrew et al. 2001), (Collins 2005), (Pruss 2005), (McGrew and McGrew 2005).
of the related concepts. Of course, this doesn’t address the final purported advantage, for which I do have some sympathy. However, I find the familiarity of lawhood insignificant in comparison to the ultimate explanatory shortcomings of primitive laws. If there are unfamiliar analyses of laws with great explanatory power, they will be worth accepting at the cost of some conceptual unfamiliarity.

7 Conclusion

I do think that primitives have an important role in ontology, and I do believe that non-Humean primitives are required to explain the uniformity of nature. However, I have suggested that the laws themselves cannot be wholly primitive. If we are to hold that laws explain the uniformity of nature, we must be willing to say more about the ontology of the laws themselves. I have suggested that there is a promising way to explain the uniformity of nature — in the form of the DTA theory — but that suggestion depends on further developments in the metaphysics of fundamentality.

References


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