

Breaking Laws of Nature

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One of the metaphysical tangles that plagues contemporary philosophy involves causal powers, laws of nature, and counterfactuals. Each is intertwined with the others in complex ways. Each is as controversial as the other two. Laws are the most familiar, as the study of physics at any level involves learning its laws. But many philosophers think that laws are merely descriptions of the causal powers at work in nature. Others believe that these issues are best understood in terms of counterfactuals and possible worlds semantics. Each of those three—laws, causal powers, and counterfactuals—is problematic in its own way, hence the conflicting views on which is the most fundamental. There is no obvious answer about which of the three is the place to start.

As philosophers of religion are realizing, one's view about divine action depends in part on how this issue is resolved.¹ If a miracle is the breaking of a law of nature, what—if anything—is being broken? To answer that, one needs to say what kind of thing a law is, which in turn requires taking a stand on whether laws, causal powers, or possible worlds is most fundamental. I will begin by considering the Humean approach to these questions, which deflates laws down to mere regularities or universal generalizations devoid of metaphysical content.² Second, there are those who take causal powers/dispositions/capacities³ as primary and laws as descriptions of their effects.

ABSTRACT: One of the main arguments against interventionist views of special divine action is that God would not violate his own laws. But if intervention entails the breaking of natural law, what precisely is being *broken*? I consider the main approaches to laws: Humean reductionism, supervenience on causal powers, the structure of possible worlds, and nomological realism. In the end, I argue that early modern natural philosophers largely had it right. Laws are not created entities or powers that act as intermediaries between God and nature; they are best understood as expressions of God's will for nature.

1. Benedikt Paul Göcke, "Did God Do It? Metaphysical Models and Theological Hermeneutics," *International Journal for Philosophy of Religion* 78 (2015): 215–31.

2. See John Earman, *A Primer on Determinism* (Dordrecht: D. Reidel, 1986), chap. 5; and John W. Carroll, "Laws of Nature," in *Stanford Encyclopedia of Philosophy*, ed. Edward N. Zalta, 2016, sections 2 and 4, <http://plato.stanford.edu/archives/spr2016/entries/laws-of-nature/>.

3. This is actually a family of views, but I will be using those three interchangeably here. See Stephen Mumford, *Laws in Nature* (New York: Routledge, 2004).

In other words, laws are not responsible for the necessary connections between events. It is the causal powers of substances (entities, beings) that are responsible for such things. The third shares the intuition that laws depend on some deeper metaphysical reality, but instead of dispositions this view points to counterfactuals: Whatever necessity laws have is dictated by the relations between possible worlds and/or subjunctive facts.⁴ Finally, nomological realists take laws themselves as primary in terms of the metaphysics.⁵ Any talk about dispositions or capacities on their view must ultimately be cashed out in terms of the laws of nature.

While the nature of the laws of nature is an important metaphysical question in itself, it plays an underappreciated role in the debate over special divine action (SDA). At least since Leibniz, noninterventionists have contended that God would not ordain laws and then break them at some later time. As we will see, this tension might either be completely resolved or at least greatly diminished depending on one's view of laws. It would seem, then, that this foundational question needs to be addressed before we can properly assess rival models of SDA.

Each of the major approaches toward natural laws will be analyzed in this paper as well as their ramifications for divine action. In the end, I argue that early modern natural philosophers largely had it right: nomological necessity⁶ is a real part of the metaphysical terrain and is best understood in terms of the laws of nature. I will argue against the prevailing view among nomological realists, however, whereby the laws themselves are thought to govern physical reality. Following British early moderns such as Boyle and Newton, I take the laws to simply be regularities within the decrees of God for nature.

Let's begin the analysis with a deflationary approach to laws.

Humean Laws

Philosophers of science tend to favor the law-first option, eschewing causal powers. However, we also tend to be Humean empiricists who prefer as lean a metaphysic as possible. Humeans believe in the existence of occurrent events. They reject causation itself as well as the idea that laws have any metaphysical significance. In their view, there is no physical necessity or fact-of-the-matter about modal claims. There are only events—happenings, occurrences, for example, when a substance changes properties. But there

4. See Marc Lange, *Laws and Lawmakers: Science, Metaphysics, and the Laws of Nature* (New York: Oxford University Press, 2009).

5. See Carroll, "Laws of Nature," section 3; and Tim Maudlin, *The Metaphysics within Physics* (New York: Oxford University Press, 2007), chap. 1.

6. By "nomological necessity" I have in mind whatever it is that grounds modal claims about physical events. It is that which separates Humeans from non-Humeans.

are no laws or dispositions over and above events that somehow guide their behavior.

One well-known Humean view is *regularity theory*: events are real and they sometimes occur in perfectly regular ways. Laws are nothing but the regularities themselves. Laws on this approach have no modal force or necessity, nor do they govern anything. For Hume, necessity and causation were psychological projections. We see a regularity in nature—two states of affairs, one consistently followed by the other—and then impose a connection between the two.⁷ But our projection of causation has no more reality than the constellations, which some thought they had detected among the stars. Regularity theorists further argue that science does not need anything more than occurrent events. Scientists do not care about metaphysics. They discover regularities and call some of them laws. Questions about necessary connections and modality are left to philosophers.

A long-standing problem for the regularity theorist is distinguishing those regularities that are actually laws from mere accidental generalizations. What makes “all charged particles in a nucleus are protons” a law, but “all of the coins in my pocket are Canadian” not? Both claims have the same logical structure. Why is one a law but not the other? Some regularity theorists take this challenge head on, trying to find a special feature of those generalizations that count as laws. Having worked his way through a roster of suggestions for this additional feature, such as “high degree of confirmation,” Fred Dretske concludes that none can successfully elevate a generalization to a law.⁸

The more difficult problem is that of uninstantiated regularities. Most laws in physics cover a range of conditions, many of which never occur in the real world. For example, the largest elements in the periodic table are lab constructs. They do not exist naturally and are intrinsically unstable. Nonetheless, it seems like there was a fact-of-the-matter of the matter about what would happen if two livermorium atoms collided, before livermorium was ever created. This is a problem since until recently, there was no livermorium that could ground any regularities whatsoever. Moreover, the entire fine-tuning literature is based on what nature would be like if a handful of fundamental parameters were changed by a slight amount. Since these parameters have never taken on values outside of their life-permitting range, there are no occurrent events representing those counterfactual situations, and therefore no regularities or laws pertaining to them.⁹ According to regularity theory, then, most of what physicists have to say about fine-tuning is

7. Latter day heirs of this view include Bertrand Russell, A. J. Ayer, and now Bas van Fraassen. See Mumford, *Laws in Nature*, 13, 34–35.

8. Fred I. Dretske, “Laws of Nature,” *Philosophy of Science* 44 (1977): 248–68.

9. Unless, as Don Page has pointed out (private discussion), the multiverse hypothesis is true. Granted, but there are many more examples of uninstantiated regularities even in a multiverse.

strictly speaking false. It seems to me that if a philosophical view is being promoted as the one that best fits science, that view ought not entail that most physicists are wrong.

A better option for the modern-day Humean is a “best systems” approach to laws, often known as M-R-L for Mill-Ramsey-Lewis. The idea is that laws are those generalizations that best systematize knowledge of the natural world. To paraphrase David Lewis, if there were an overall deductive system of scientific facts, or maybe several such systems, the laws would be those generalizations that would appear either as axioms or theorems in those systems with the best combination of robust content and simplicity.¹⁰ Hence, if plane geometry were a science, then Euclid’s axioms would be laws.

M-R-L has a number of strengths. First, it clearly demarcates laws from mere universal generalizations: the latter fail to be theorems in our best deductive systems. Second, M-R-L allows for today’s textbook laws to be wrong, since they may not survive in our best system. Third, it allows for undiscovered laws, since the best system might be something other than what we currently have in hand. Fourth, textbook laws can provisionally be considered laws since they might be retained as axioms or theorems. These virtues explain why some version or other of the M-R-L approach seems to be favored by philosophers of science.

Philosophers of religion and metaphysicians, on the other hand, do not much like it. Why not? There is an important distinction, they rightly point out, between laws and law-statements. Law-statements are what one finds in physics and chemistry classrooms—something one could point to, like the ideal gas law. The laws themselves, if there are any, are the actual laws of nature that scientists are trying to discover. Laws cannot be wrong; they just are whatever they happen to be. Law-statements, on the other hand, are descriptions of laws. If a law-statement is true, then it is the law of nature that it describes that makes it true.¹¹

With that distinction in hand, we can see that the best systems approach shifts the entire issue to the side of law-statements. The metaphysics of law, says the M-R-L proponent, has been successfully addressed by Hume. The only remaining question is which generalizations should be given the honorific “law”? Note that generalizations are propositions or sentences.¹² Hence, when Lewis says that laws are theorems in a deductive system, he really means law-statements. They are (or are expressed by) concrete entities that could be written on a piece of paper. For a Humean empiricist, this one-sidedness is not a deficiency since they do not believe there are such things

10. David K. Lewis, *Counterfactuals*, rev. ed. (Malden, MA: Blackwell, 2001), 73.

11. Humean empiricists will argue that this way of putting things is biased toward nomological realism, as it assumes there are laws of nature governing events. Even so, the distinction between laws and law-statements stands. The Humean believes that the former do not exist.

12. See Earman, *A Primer on Determinism*, 87–8, for selected quotations and exposition.

as laws themselves that govern events. For most metaphysicians, in contrast, the M-R-L view is incomplete at best and question-begging at worst. It is attractive only if the Humean deflation of laws is correct. But few metaphysicians or philosophers of religion are willing to accept Hume's impoverished ontology. They do not believe that laws can be reduced to occurrent facts alone.

If the best systems view were correct, then many problems regarding divine action would be immediately solved. Laws of nature have no metaphysical standing on this approach. For there to be M-R-L laws, there would first have to be a set of true sentences that could then form the basis of a deductive system. Hence, there were no laws on this view before life evolved, just as there was no such thing as grammar or rules of etiquette. Nor are there any necessary connections or causal relations between events that God could override. "Breaking a law of nature" under M-R-L just means the God does something contrary to what we would have expected based on what we know (that is, based on the best deductive system of scientific knowledge). In terms of divine action, I rather doubt that God cares whether his actions conflict with our expectations.

Dispositions and Powers

The trend among metaphysicians is to take causal powers or dispositions as primary. Dispositionalists believe, *contra* Hume, that there are modal facts. Consider the conditional "If you were to raise the temperature of a piece of paper to 246° C, it would ignite." Such counterfactuals are made true on this view by causal powers and dispositions, in this case the disposition of the paper to burn. This means that laws have a lesser standing, metaphysically speaking. Once a particular set of atoms conforms to molecular salt, those atoms have a disposition to behave in various ways. Their actual behavior will depend in part on the circumstances. A lump of such molecules has the disposition to dissolve in water, but it is unlikely to do so while sitting in the saltshaker in my cupboard. The same molecules have a separate causal power to attract other bits of matter by way of gravitation. But again, it's not the law of universal gravitation that is responsible for this attraction. On this view, objects with mass have the disposition to attract each other in a particular way.¹³ Law-statements are just convenient summaries of the behavior governed by capacities.

13. "[Mass] is a disposition that manifests itself in the mutual attraction of massy objects. The presence of another mass m' acts as a stimulus on m (and conversely) for the manifestation of the disposition in terms of a mutual acceleration. As soon as there are at least two massive objects in a world, that disposition is triggered. It is essential for the property of gravitational mass to manifest itself in the mutual attraction of the objects that instantiate this property. That's what gravitational mass *is*—the property that makes objects accelerate in a certain manner" (Mauro

Dispositionalism has a number of strengths and prominent supporters, including metaphysician Stephen Mumford and philosopher of science Nancy Cartwright.¹⁴ They take laws to have little metaphysical significance. In terms of SDA, many of the perennial worries about God breaking his own laws therefore become less pressing. God did not decree any *laws* on this view; God created things with causal properties. What we call laws are epiphenomenal.

Nonetheless, it seems that one could translate law-talk into disposition-talk, whereby God would have to override the capacities of objects in order to act. If one is worried about divine intervention, then the root problem still remains. God made decisions about the causal powers of nature, and yet later disrupted their guidance of natural processes. In other words, SDA is still an intervention, regardless of whether those processes are based on laws or on dispositions.¹⁵

There is no knock-down argument against dispositionalism. This is one of those questions where science radically underdetermines metaphysics, which is why there is so much well-informed disagreement.¹⁶ Nonetheless, many philosophers of science are suspicious of this approach, even among those who are not Humeans.

Dispositions are rooted in an Aristotelian way of thinking. They tend to be thing-centered: substances, in a technical sense. These are the sorts of entities in which properties can be instantiated. However, some very important physical properties are not embedded in material objects, center of mass for example.¹⁷ This is a measurable property, yet there often is no object that exists at the center of mass of a system. The center of mass of our solar system

Dorato and Michael Esfeld, "The Metaphysics of Laws: Dispositionalism vs. Primitivism," in *Metaphysics in Contemporary Physics*, ed. Tomasz Bigaj and Christian Wüthrich (Boston: Brill, 2016), 403–24.

14. Mumford, *Laws in Nature*. Nancy Cartwright, *Nature's Capacities and Their Measurement* (Oxford: Clarendon, 1989). For philosophers of religion who also advance such accounts, see Travis Dumsday, "Laws of Nature Don't Have Ceteris Paribus Clauses, They Are Ceteris Paribus Clauses," *Ratio* 26 (2013): 134–47; and Walter Schultz, "Dispositions, Capacities and Powers: A Christian Analysis," *Philosophia Christi* 11 (2009): 321–38.

15. Unless, as Del Ratzsch points out (private correspondence), God uses rare or hidden capacities that are seldom triggered. Such capacities could be brought into play to produce unusual effects that do not thereby override those capacities we are familiar with. See Göcke, "Did God Do It?" and Dani Adams, "God and Dispositional Essentialism: An Account of the Laws of Nature: God and Dispositional Essentialism," *Pacific Philosophical Quarterly* (2016), doi:10.1111/papq.12162 for models of SDA based on the priority of dispositions.

16. An anonymous referee objects that without some sort of robust metaphysical basis, such as dispositions, there is no answer to Hume's problem of induction. However, this is philosophical objection, not a scientific one; the science alone does not resolve the underdetermination. Even if we grant the point about induction, it does not necessarily decide the matter in favor of the dispositionalist as there are other non-Humean approaches to be considered.

17. Mark Wilson, *Wandering Significance: An Essay on Conceptual Behaviour* (New York: Oxford University Press, 2006), 261.

is often thousands of miles from the Sun. In what does this dispositional property reside when its location is empty space?¹⁸

A second argument is based on the history of science. The return to a more Aristotelian framework is odd given that medieval versions had to be set aside in order for the scientific revolution to proceed. Formal causes and substantial forms were intentionally displaced by a law-centered view. This had two main effects. First, scientists realized that while God had ordained the laws, there was a vast range of possibilities to choose from. Since God's choices had not been revealed to us, the only way to know them was through empirical investigation and experiments.¹⁹ In other words, empiricism itself, which we so closely associate with science, was rooted in a law-centric, theistic framework.

The second consequence of the shift to a law-centered approach was the discovery of more laws over time. Not only did natural philosophers believe that laws exist, they found them. (Newton gets most of the credit in popular accounts, but Descartes was far more revolutionary in terms of the move from Aristotelian-Thomism.) One of the pillars of scientific realism is the intuition that if something works well, there is usually a reason it works. Consider the overwhelming fruitfulness in physics and chemistry of the law-centered view. If dispositionalism were right all along, why then the need to dismiss it in order to make such progress? Modern day dispositionalists try to show how history never *disproved* their view and that, strictly speaking, all of the law-based discoveries were compatible with their metaphysics. Fine. But why go back? One might have theological reasons, as many Roman Catholics do. Or one might think that dispositionalism is the right approach to metaphysics, and its application to the question of laws is just one aspect of a broader program. But for one who is philosophically and theologically neutral about the primacy of dispositions vs. laws, the history of science seems to strongly favor the latter. But this is not the most important objection.

The main concern among philosophers of physics is that the appeal to causal powers is a step backward in terms of precision. There are many aspects of modern physics that are now taken for granted. We understand the difference between force, energy, and momentum, to name a few. But in the history of science, these were all hard-won distinctions. Consider force. Is that something a body has or something that acts on a body? How should it

18. Dorato and Esfeld allow for dispositions in configurations of matter, which would escape this particular problem. See their "The Metaphysics of Laws." Even so, they note that any dispositional account will have difficulty with the nonlocality of quantum mechanics.

19. Descartes was the exception to this rule. The point of view expressed here most closely aligns with seventeenth-century natural philosophers in Britain such as Boyle and Newton. And while Aristotle himself was something of an empiricist, as Del Ratzsch notes (private correspondence), that did not include experiments, which were thought to produce "violent" rather than "nature" behavior. For more see Jeffrey Koperski, *The Physics of Theism: God, Physics, and the Philosophy of Science* (Chichester, UK: Wiley-Blackwell, 2015), 20–2.

be measured if it is causing motion, over time or over distance? (The first, we have since discovered, corresponds to a *change in linear momentum*, and the second to *work*.) And what about conservation? Is *vis viva* (mv^2) conserved as Leibniz believed, or is it *quantity of motion* (mv) as the Cartesians argued? The intellectual achievement in making these distinctions is hard to describe. They involved nasty disputes between Cartesians, Leibnizians, and Newtonians, all of whom could point to observations that confirmed their side.²⁰ Each camp employed physical, metaphysical, and theological arguments, implying that more was at stake than the advancement of science.

Today, things are far clearer. Instead of force *simpliciter* there are contact forces, special force laws, constitutive equations, and fundamental forces. There are not just laws, but entire families of differential equations all developed with an eye to helping understand the underlying physics. The question then is why philosophers would now want to retreat to the far less precise notion of dispositions or causal powers? This seems to muddy the very same waters that took centuries to clear up *just within classical mechanics*. Del Ratzsch expresses it this way:

Although this view has a number of attractions . . . , it is still seriously incomplete as an analysis until we know what sort of animal a dispositional property is. The attractiveness which this very fuzziness may permit may dissipate along with the fuzziness when we try to sharpen the picture up a bit.²¹

Causal powers and dispositions harken back to prescientific intuitions that are perhaps more familiar than the intricacies of a law in the form of a differential equation, but they moosh together physical categories that very much need to be kept apart. Again, that is not a knock-down argument; there isn't one. But it does explain why most philosophers of physics have not gravitated toward dispositionalism.

Counterfactuals and Possible Worlds

The second half of the twentieth century saw tremendous interest in counterfactuals, modal logic, and possible worlds semantics. While originally developed as ways to understand possibility and necessity, they soon ramified across analytic philosophy. One (infamous) development in this literature is *modal realism*: possible worlds are not merely abstract ideas, but have concrete existence. Its foremost proponent was David Lewis:

I believe, and so do you, that things could have been different in countless ways. But what does this mean? Ordinary language permits

20. Free fall experiments seemed to favor Leibniz. Collision experiments with inelastic bodies confirmed Newton's position.

21. Del Ratzsch, "Nomo(theo)logical Necessity," *Faith and Philosophy* 4 (1987): 386.

the paraphrase: there are many ways things could have been besides the way they actually are. I believe that things could have been different in countless ways; I believe permissible paraphrases of what I believe; taking the paraphrase at its face value, I therefore believe in the existence of entities that might be called 'ways things could have been.' I prefer to call them 'possible worlds.'²²

As we have seen, Lewis does not rely on possible worlds in his account of laws. (M-R-L reduces laws to law-statements within a deductive system of scientific knowledge.) Counterfactuals instead come into play in Lewis's analysis of causation. He argued that causal relations are a type of counterfactual dependence, and counterfactual dependence can be cashed out in terms of the structure of possible worlds.²³ Hence for Lewis, possible worlds are more fundamental than causation or laws.

The foremost proponent of a counterfactual approach to law today is Marc Lange.²⁴ Counterfactuals, he rightly points out, are notoriously sensitive to context. To update Lewis's famous example, consider the counterfactual situation in which Caesar were in command in the fight against ISIS. Which of the following is true?

- (1) If Caesar were in command in the fight against ISIS, he would use nuclear weapons.
- (2) If Caesar were in command in the fight against ISIS, he would use catapults.

Lewis argued that the right answer depends on the context of the question. There is no context-free fact-of-the-matter about which is correct. According to Lange, law-statements are different. Unlike most counterfactual claims, laws are stable with respect to changes of context. This explains why "all of my students are seated" is a mere accidental generalization. It is not counterfactually stable:

- (3) If none of my students were to move during class, then all of my students would be seated. True
- (4) If one of my students needs to sharpen a pencil, then all of my students would be seated. False

However,

- (5) If none of my student were to move during class, then protons would be positively charged. True
- (6) If one of my students needs to sharpen a pencil, then protons would be positively charged. True

22. David K. Lewis, *Counterfactuals* (Cambridge, MA: Harvard University Press, 1973), 84.

23. David K. Lewis, "Causation," *Journal of Philosophy* 70 (1973): 556–67.

24. Lange, *Laws and Lawmakers*.

The consequents in (5) and (6) are insensitive to changes in context. Lange's claim is that laws display this sort of counterfactual stability come what may. More precisely, law-statements are grounded in counterfactual sentences exhibiting this sort of stability. The truth-makers for counterfactual sentences are *counterfacts*: facts about the distribution of possible worlds.

Lange's account has several advantages. First, it marks a clear demarcation between laws and mere universal generalizations. The latter are not sufficiently stable. Unlike other approaches that presuppose knowledge of the laws in order to infer relationships between possible worlds, this one avoids "arbitrarily privileging the laws from the outset."²⁵ Second, stability explains the non-Humean idea that laws have a kind of necessity. The correct order of priority, argues Lange, is stability among counterfactuals, which then allows us to determine those truths that are "naturally necessary" (what some call "nomologically necessary"), which in turn points to which generalizations are laws.²⁶ Third, Lange argues that his account can explain a variety of related ideas: (i) the immutability of laws, (ii) the nature of meta-laws (for example, conservation laws that govern other laws), and (iii) the relation of law to chance.²⁷ These are significant payoffs.

While there is much one could say by way of critique,²⁸ in my view there is one overriding problem with taking relations among possible worlds as the truth-makers for law-statements. It is not counterfactual stability that permits successful inferences about necessity and laws. It is our knowledge of the laws that allows for inferences about counterfactual stability. How do I know that if I had worn a different shirt to class that it would not affect the charge of protons? Because we know the relevant laws.²⁹ Our counterfactual judgments are parasitic on what we take the laws to be. This, I believe, is what makes Lange's innovative approach a nonstarter for most philosophers. The metaphysical priority seems to be exactly the opposite of what it should be.

In order to know the implications of such a view for divine action, other questions would have to be answered first. What is the ontological status of possible worlds? Does God come to know which counterfactuals are stable by way of (something like) middle knowledge, or does God create counterfactual stability by arranging the proximity of possible worlds? If the former, God would seem to have a rather passive relationship to the laws of nature. In fact, it seems that God would be discovering counterfactual stability and thereby the laws much the same way God discovers the free choices of persons. If, on the other hand, God creates counterfactual stability by arranging possible worlds, then SDA amounts to God causing events in the actual

25. *Ibid.*, 43.

26. *Ibid.*, chap. 2.

27. *Ibid.*, chap. 3.

28. Heather Demarest, "Do Counterfactuals Ground the Laws? A Critique of Lange," *Philosophy of Science* 79 (2012): 333–44.

29. The dispositionalist would say instead that it is our knowledge of causal powers.

world in a way that is contrary to counterfactual stability. That is precisely what “breaking the laws of nature” would be: God acting in a way that violates counterfactual stability.

I have argued that (i) Humean laws are overly burdened by empiricist constraints, (ii) causal powers are vague and do not comport well with the history of science, and (iii) counterfactual truths are dependent on more fundamental nomic relations. The last remaining option deals with laws on their own terms.

Nomological Realism

According to *nomological realism*, laws are irreducible aspects of reality. They do not supervene on events, as Humeans believe, nor on causal powers. They are the truth-makers for law-statements, which in turn allow for correct counterfactual inferences.

The best-known type of nomological realism is associated with David Armstrong, Fred Dretske, and Michael Tooley. They take laws to be necessary relations between universals.³⁰ Consider the law-statement “all metals conduct electricity.” On this view, the terms “metal” and “electric conductor” refer to universals—properties that cannot be reduced to something more basic. If this law-statement is true, then those universals are related in such a way that the former necessitates the latter.³¹ This explains counterfactual judgments such as what would happen if one were to drop a wrench across both terminals of a car battery. More generally, for any true law-statement “all *F*s are *G*s,” the universals *F*-ness and *G*-ness are related by way of necessitation.

It is no surprise that Humean empiricists have little patience for this theory, with its mind-independent universals and unobservable necessitation relation. We can detect metals and electricity, but it is unclear what our epistemic access is to universals themselves. And while the necessitation relation does all of the important modal work, Armstrong leaves it as primitive and unanalyzable. There is no explanation for how the necessitation relation comes to influence *this* particular *a* that is *F* and this *b* that is *G*. As van Fraassen complains, “necessitation” seems like a name for something that is wholly mysterious.³² But if one is going to take something as important as necessitation as basic, then why not play that card sooner?

30. See Carroll, “Laws of Nature,” sec. 3 for an introduction. Precisely what sort of necessity is in view here is a matter of dispute, but most take it to be nomological necessity—something weaker than logical necessity.

31. At least in this possible world. For Armstrong, there are possible worlds in which these universals are not so related.

32. Bas C. Van Fraassen, *Laws and Symmetry* (Oxford: Clarendon, 1989), 104–7.

Which is precisely what philosopher of physics Tim Maudlin does. Noting the importance of laws in metaphysics and in science, he takes laws of nature themselves as primitive. After all, every ontology has some bits that are basic and unanalyzed. Maudlin thinks law and the governance-relation are as good of a starting place as any other:

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 notion of a law cannot be reduced to other more primitive notions. The only hope of justifying this approach is to show that having accepted laws as building blocks we can explain how our beliefs about laws determine our beliefs in other domains.³³

In other words, taking laws as basic allows for an analysis of both dispositions and counterfactuals that is far more complete and natural than trying to analyze laws from some other standpoint. And that explanatory power in turn justifies taking the laws as primitive.

One might think that the early moderns would be happy with one of these versions of nomological realism, either Armstrong's universals or Maudlin's primitivism. After all, Descartes, Boyle, Newton and their contemporaries were the ones who first introduced law-language to describe the natural order, and these views honor the primacy of law.

I think instead that most early modern thinkers would be dismayed at how laws are thought of today. Let's consider this historically. Why did seventeenth-century philosophers, especially British natural philosophers, move away from Aristotelianism in the first place? There were several reasons, including the obscurity of many of its key components. But one important consideration was that substantial forms were considered useless intermediaries between God and creation. An omnipotent, omniscient being would not need to employ essences embedded in prime matter in order to get nature to behave in the right way. According to Boyle, the medieval view undermines

the honor of the great author and governor of the world, that men should ascribe most of the admirable things, that are to be met with in it, not to him, but to a certain nature. . . . For my part, I see no need to acknowledge any architectonic being besides God. . . . Those things which the [medieval] school philosophers ascribe to the agency of nature interposing according to emergencies, I ascribe to the wisdom of God.³⁴

If substantial forms do all the work, the argument goes, then the creative activity of God becomes less apparent. And since God, the omniscient ar-

33. Maudlin, *The Metaphysics within Physics*, 18.

34. Robert Boyle, *The Works of the Honourable Robert Boyle*, vol. 4 (A. Millar, 1744), 361.

chitect, does not need such entities anyway, parsimony dictates that they be rejected.³⁵

Their alternative to Aristotle was not nominalism or Humean skepticism, but laws, understood as nothing more than divine rules by which nature must act. Substantial forms were rejected in favor of God's direct and unmediated governance. As Newton's follower Samuel Clarke says in his second letter to Leibniz,

With regard to God . . . [there are] no powers of nature at all, that can do any thing of themselves, (as weights and springs work of themselves with regard to men); but the wisdom and foresight of God, consist . . . in contriving at once, what his power and government is continually putting in actual execution.³⁶

For Clarke and others, what we call "laws" are simply God's chosen regularities for how nature will behave. Laws were not thought of as autonomous agents that God created in order to govern nature. If God had wanted to create some power or being to govern the universe for him, then substantial forms would have been ideal. The early moderns did not exchange one set of governing entities for another; they rejected the middleman in favor of God's direct rule, what they referred to as laws.³⁷ God's choices could be discovered much the way one could discover the rules of football by observing enough games. And just as one could be wrong about whether a backward pass is legal or not, natural philosophers had imperfect knowledge of the laws of nature. Descartes's laws of motion were a step in the right direction, but Newton's were better.

Contrast this with how the laws of nature are typically understood today. It is often taken for granted that if we can explain some phenomenon by appeal to law, there is no longer any need for God. God and law are put forward as rival explanations, as if it were mutually exclusive that either God governs the universe or laws do that. Newton and Boyle would be utterly puzzled by this dichotomy.

35. This was not universally held at the time. Theists soon came to accept intermediaries once again, whether the laws themselves, vital forces, or something else. See John Hedley Brooke, "Natural Law in the Natural Sciences: The Origins of Modern Atheism?," *Science & Christian Belief* 4, no. 2 (1992): 83–103 for more on this ambivalence.

36. Gottfried W. Leibniz and Samuel Clarke, *The Leibniz-Clarke Correspondence: Together with Extracts from Newton's Principia and Optics*, ed. H. G. Alexander (1717; Manchester: Manchester University Press, 1956), 23.

37. This is not to suggest that all natural philosophers at this time had a single well-articulated view of laws. The one presented here is best represented by Boyle: "Nature is not to be looked on, as a distinct or separate agent, but as a rule, or rather a system of rules, according to which these agents and the bodies they work on, are, by the great Author of things, determined to act and suffer" (Robert Boyle, *A Free Enquiry into the Vulgarly Received Notion of Nature*, ed. Edward B. Davis and Michael Cyril William Hunter (1686; New York: Cambridge University Press, 1996), 106).

This, then, is why I think that those same thinkers would not be enthusiastic about the types of nomological realism in the literature today. Both Armstrong and Maudlin take laws to be responsible for ensuring nomic regularities. More precisely, Armstrong argues that universals ground the laws; Maudlin takes laws and the governance relation to be primitive. But in both cases, the laws have a kind of metaphysical autonomy and responsibility for why the universe runs the way it does. I believe the early moderns would see these as every bit the intermediaries that they were trying to get rid of with their rejection of Aristotelian essences. On their view, the laws had no independent metaphysical standing or power to bring about anything. Many seemed to have in mind something like creation itself. God said “Let there be light” and there was light. Consider Newton’s analogy with human thought:

Since each man is conscious that he can move his body at will, and believes further that all men enjoy the same power of similarly moving their bodies by thought alone; the free power of moving bodies at will can by no means be denied to God, whose faculty of thought is infinitely greater and more swift. And by like argument it must be agreed that God, by the sole action of thinking and willing, can prevent a body from penetrating any space defined by certain limits.³⁸

Again, God needs no intermediaries in order to govern the cosmos. God wills an event and it comes about. Laws are merely the regularities that God has chosen to be the case.

Decretalism

Following Alvin Plantinga, let’s call this view *decretalism*, as laws simply are God’s decreed regularities for natural processes.³⁹ Consider its strengths. First, decretalism fits historically with why laws were first introduced. There is no controversy about the theological basis for the idea nor that it was a key concept in the scientific revolution. Second, decretalism is

38. Isaac Newton, “De Gravitatione Aequipondio Fluidorum et Solidorum,” in *Unpublished Scientific Papers of Isaac Newton*, ed. A. R. Hall and N. B. Hall (Cambridge: Cambridge University Press, 1962): 138–9. A similar idea can be found in Newton’s *Opticks*, Query 31. In his letter to Bentley (25 Feb. 1693), Newton argues that gravity might ultimately have no other cause than God’s direct will or there might be some undiscovered mechanism. Either way, the equation describing universal gravitation would remain the same. In the latter case, the law would have been imposed on the mechanism, so that ultimately all laws are implemented by God.

39. Alvin Plantinga, “Law, Cause, and Occasionalism,” in *Reason and Faith: Themes from Swinburne*, ed. Michael Bergmann and Jeffrey E. Brower (New York: Oxford University Press, 2016), 135. As Travis Dumsday has pointed out (private discussion), the view advanced here is relevantly similar to that of John Foster in his *The Divine Lawmaker: Lectures on Induction, Laws of Nature, and the Existence of God* (Oxford: Clarendon, 2004). Foster argues that all of the naturalistic accounts of law discussed thus far in this paper fail. The best explanation for those regularities that allow for induction, he argues, is personal and supernatural.

thoroughly theistic, bridging the philosophy of science and the philosophy of religion. It does not treat God as an optional appendage added onto an otherwise naturalistic view. Third, like all forms of nomological realism, decretalism fits with contemporary physics insofar as fundamental science is still law-centric.⁴⁰ Fourth, as an analysis of natural law, it is at least as defensible as Maudlin's primitivism, which is one of the major contemporary views in the literature. Decretalism merely goes a step further, attributing Maudlin's governance relation to God instead of leaving it unanalyzed.

So, why not decretalism about law? Naturalists obviously cannot accept this view, but that should only minimally bother a theist. One might instead complain about obscurity: *how* precisely does God govern by way of decree? Nothing here describes the causal joint between law and event. While one can sympathize with that question, every primitive bit of metaphysics is subject to the charge of obscurity. Armstrong takes necessitation as primitive. For Maudlin it's the governance relation and for others it is causal powers and dispositions. They are all obscure in the sense that they contain unanalyzed brute facts. Nonetheless, everyone has to stand somewhere, even the Humean. Just because someone might have still more questions to ask is not itself a problem. For example, can anyone say how the Higg's field bestows mass on elementary particles? What precisely does the causal joint look like? Can anyone explain how an exchange of particles binds electrons to a nucleus? As every parent knows, eventually the right answer is simply "that's just the way it is."

If there is a worry that decretalism must overcome, it is that butt of philosophy-student jokes everywhere: occasionalism. If all physical events are governed by law and laws are expressions of divine command, then ultimately God causes all physical events. As Nancy Cartwright puts it,

This [that is, decretalism] is a kind of Occasionalism: the source of the necessity of the relations between force and mass and acceleration is that, whenever God sees a force acting on a mass, He ensures that the acceleration is what it's supposed to be. That would be the Occasionalist sense of calling the relationship between F , m and a "necessary."⁴¹

The problem is that all of the causal influences that seem to exist in nature are really something else entirely. Occasionalism is a type of anti-realism. While it looks like the pressure of my hand causes the coffee mug to slide across the table, that cannot literally be true. There are no natural

40. This is not universally accepted. Some philosophers argue that science relies on models, not laws. See Ronald N. Giere, *Science without Laws* (Chicago: University of Chicago Press, 1999).

41. Nancy Cartwright, "How Could Laws Make Things Happen?," in *Laws of Nature, Laws of God?: Proceedings of the Science and Religion Forum Conference, 2014*, ed. Neil Spurway (Newcastle upon Tyne: Cambridge Scholars, 2015), 119.

causes, says the occasionalist. In the words of Nicolas Malebranche “there is only one true cause because there is only one true God; . . . the nature or power of each thing is nothing but the will of God; . . . all natural causes are not *true* causes but only *occasional* causes.”⁴² And so it seems—and indeed seemed to a number of early modern thinkers—that decretalism leads to antirealism about all natural causation.⁴³

Decretalists might respond by biting the bullet, as Plantinga himself has recently done in endorsing a form of occasionalism.⁴⁴ Perhaps if one is a Calvinist, then occasionalism does not seem like much of a stretch. For others, it is likely a theological bridge too far.

So far as I can tell, though, decretalism does not entail occasionalism.⁴⁵ It is not the case that within every causal interaction, God steps in to supply the missing glue or oomph that nature is devoid of.⁴⁶ That sort of ever-present intervention does seem vulnerable to Leibniz’s clockmaker objection: Instead of creating a world in which God needs to constantly intervene to keep the machine running, why not just build one with that runs on its own?

Alternatively, one could take God’s declaration of law as being prior to creation. Particles, bodies, and fields forevermore act accordingly. There is no need for God to continually step in and repeatedly assert his will, as if nature forgets from one moment to the next. God’s ordaining of the laws was a unique event that grounds the present reality of physical interactions.⁴⁷ It may help here to recall the close relation my account has with Maudlin’s primitivism. Both understand nomological regularities in terms of law. But whereas Maudlin leaves law and governance unanalyzed, the decretalist has more to say. God’s will establishes both physical regularities and the instantiation of those regularities in this possible world (governance).

42. Sukjae Lee, “Occasionalism,” in *Stanford Encyclopedia of Philosophy*, ed. Edward N. Zalta, 2016, <https://plato.stanford.edu/archives/win2016/entries/occasionalism>.

43. There are interesting parallels here to Jaegwon Kim’s causal drainage problem in the philosophy of mind. See Kim’s *Physicalism, or Something Near Enough* (Princeton University Press, 2008), 57–60, and Daniel Lim, “Occasionalism and Non-Reductive Physicalism: Another Look at the Continuous Creation Argument,” *International Journal for Philosophy of Religion* 75 (2014): 39–57.

44. Plantinga, “Law, Cause, and Occasionalism,” 144.

45. As Peter Harrison shows, one is a matter of divine will and the other is about the nature of causation. Moreover, the arch-occasionalist Malebranche was not a voluntarist/decretalist regarding laws. See Peter Harrison, “Voluntarism and Early Modern Science,” *History of Science* 40 (2002): 7.

46. As one referee points out, this is more precisely “what is *presumably* a causal interaction.” While I am not an eliminativist about causal language, I do take causation in elementary physics to be less fundamental than law.

47. Alternatively, if upholding the universe in existence is something that God continually does, then the laws are upheld in the same manner. This has some advantages for SDA. See Peter van Inwagen, “The Place of Chance in a World Sustained by God,” in *God, Knowledge, and Mystery*, ed. Thomas V. Morris (Ithaca, NY: Cornell University Press, 1988), 42–65. Although van Inwagen describes his account in terms of causal powers, those powers are mutable and continually dependent on God’s will, bringing it very close to decretalism.

Contra the occasionalist, however, it is not the case that God typically wills individual events. Consider an example from van Inwagen.⁴⁸ Say we create two electromagnets by wrapping pieces of soft iron with wires and then passing current through those wires. If the electromagnets are close, they will produce forces on one another. Now, would we say that the generator supplying the current is moving the two pieces of iron? No, the pieces of iron are moving each other in virtue of Maxwell's laws of electromagnetism. One could even say that the newly created electromagnets are causing each other to move, understanding that this is shorthand for relations that are in reality matters of law. Under decretalism, God does not cause the pieces of iron to move in this example. God decrees the laws which will then play out in a variety of ways. God's nomological decrees are necessary but not sufficient conditions for almost all physical events, much as the generator is necessary but not sufficient for the motion of the iron. But just as we would not say that the generator causes the iron to move, it would be odd to say that God is the cause of all physical events. In short, decretalism does not entail occasionalism or at least not the sort of causal deception that prompts so much snickering among students.⁴⁹

Decretalism and SDA

Turning then to the question of SDA under decretalism, at least one modern phrase turns out to be misleading, the idea of "breaking the laws of nature." This seems to imply, however loosely, that there is some sort of mechanism that could possibly be broken. The decretalist asserts instead that when God ordains a law, nothing new comes into being. There is no structure or causal power that *is* a law that God might possibly disrupt at some future time. In order to make sense of God's "breaking" or "violating" the laws of nature, noninterventionists seem to presuppose a type of nomological realism other than decretalism. There must be some *thing* to be broken—a set of entities or powers at work in the universe.

On the other hand, there is a sense of "breaking a law" that does not require the independent existence of laws themselves. There is something objectively wrong, say, about a defensive end crossing the line of scrimmage before the ball is snapped: that event breaks the rules of football. "Breaking" here is a metaphor. It does not entail that rules exist as something other than social constructions. Similarly, God could break a law insofar as some new

48. *Ibid.*, 213.

49. An anonymous referee is not convinced that this escapes the charge of occasionalism. If not, at the very least I would argue that some forms of occasionalism are more pernicious than others. The point here is that decretalism does not entail that every physical event requires a new act of divine will. We should also note that decretalism is an alternative to causal powers and capacities, not causation itself.

act temporarily overrides a previously ordained regularity, even if laws do not themselves exist. This shows how a noninterventionist might still have something to worry about vis-à-vis violating natural law even if decretalism is the case.

Furthermore, some noninterventionists have argued that the real worry is not with the metaphysics of intervention but rather that violation of law implies a kind inconsistency, as Robert Russell argues:

[Since] God's intervention breaks the very processes of nature which God created and constantly maintains, it pits God's special acts against God's regular action, which underlies and ultimately causes nature's regularities.⁵⁰

Intervention entails a conflict within the divine will, says Russell, and so models of SDA must avoid it for theological reasons. If this is the root concern for noninterventionists, then any type of nomological realism could be used to state the objection. Laws constitute divine choices that later interventions would contravene, regardless of their metaphysical grounding.

This goes to show that decretalism is not itself a model of SDA. It is compatible with either an interventionist or noninterventionist approach. Under the former, God ordained laws in the past, but occasionally chooses to act contrary to those laws. A decretal noninterventionist, on the other hand, must adopt a metaphorical understanding of "breaking the laws of nature" but can otherwise endorse this view.

Toward a New Model of SDA

The questions explored here have been foundational: what sort of thing might God possibly be breaking vis-à-vis SDA? Under decretalism, a law of nature is not a substance, property, or autonomous capacity "out there" governing the universe. There is no such thing as a law. The only sense in which God could break a law, on this view, is metaphorical or legal. Were God to ignore some previously ordained decree and thereby "break" a law of nature, nothing would literally be broken.

Another issue to be explored is how much freedom decretalism allows. Interventionists see few limits on divine action: God can suspend the laws as desired. Noninterventionist models, on the other hand, restrict SDA. Under Russell's NIODA, for example, God can only (nonmiraculously) act within the ontological gaps afforded by quantum indeterminacy. But if such events cannot be readily amplified into the macroscopic realm, then there is little

50. Robert J. Russell, "Quantum Physics and the Theology of Non-Interventionist Objective Divine Action," in *The Oxford Handbook of Religion and Science*, ed. Philip Clayton (New York: Oxford University Press, 2008), 584.

God could do by way of quantum mechanics.⁵¹ The challenge for this and all forms of noninterventionism apart from deism is to find sufficient room in which God can act within the constraints of whatever mechanism has been identified by their preferred model.

An avenue that has not been fully explored is decretal noninterventionism in a physically deterministic universe. Such a model could provide for significant freedom and yet not require exotic physics. The groundwork for such a view has already been laid by William Alston, Alvin Plantinga, and Robert Larmer.⁵² What has not been done is to connect all of the dots from the metaphysics of the laws of nature, as discussed in this paper, through questions of physical determinism and causal closure, to the nature of contingency in a world with natural laws. Most noninterventionists believe that determinism and law-governedness preclude divine action, except by way of miraculous violations. I believe this is mistaken, but showing why will have to be taken up another time.⁵³

51. For an argument that the amplification problem cannot be solved, see Jeffrey Koperski, "Divine Action and the Quantum Amplification Problem," *Theology and Science* 13 (2015): 379–94.

52. William P. Alston, "Divine Action: Shadow or Substance?," in *The God Who Acts: Philosophical and Theological Explorations*, ed. Thomas F. Tracy (University Park, PA: Pennsylvania State University Press, 1994), 41–62; Alvin Plantinga, "What Is 'Intervention'?", *Theology and Science* 6 (2008): 369–401; Robert A. Larmer, "Miracles, Physicalism, and the Laws of Nature," *Religious Studies* 44 (2008): 149–59.

53. My thanks to Del Ratzsch for extensive comments on a previous draft and to Travis Dumsday, Doug Geivett, and Robert Larmer for discussions on a conference version of this paper. Thanks finally to an anonymous referee for *Philosophia Christi*.