4. *Leges sive natura*: Bacon, Spinoza, and a forgotten concept of law

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[draft version – please see Ott and Patton 2018 for official version]

> [I]n this *Organon* of ours we are dealing with logic, not philosophy. But our logic instructs the understanding and trains it, not (as the common logic does) to grope and clutch at abstracts with feeble mental tendrils, but to dissect the powers and actions of bodies and their laws limned in matter [*in materia determinatas*].[1]

The way of laws is as much a defining feature of the modern period as the way of ideas. In one of its forms, it stands as an alternative to the moribund Aristotelian ontology. A world devoid of powers is, in Ralph Cudworth's memorable phrase, 'a dead cadaverous thing,'[2] and explaining why objects in it behave as they do requires appeal to something other than their intrinsic properties. For Descartes and his followers, the way of laws leads to occasionalism. Since bodies cannot obey laws in any but a metaphorical sense, God must be moving them around himself.[3]

But the way of laws is hardly without its forks. Both before and after Descartes, there are philosophers using the concept of laws to carve out a very different position from his. Descartes's application of the concept of law in the context of physics has been so influential as to make this competing position all but invisible. Here, I uncover what is, as far as I can tell, an unappreciated

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[1] Francis Bacon, *New Organon* II.lii: 219-20. (References to the 'NO' are to the Michael Silverthorne translation and are in the following form: Book.aphorism: page number in Bacon 2000a.) Compare Spinoza's appendix to Part Four of the *Ethics*, section xxvii: 'The principle advantage we derive from things outside us – apart from the experience and knowledge we acquire from observing them and changing them from one form into another – lies in the preservation of our body.' (References to Spinoza's *Ethics* and Letter 32 are to the Curley translation in Spinoza (1985). References to other works are to Shirley's translation (2002) unless otherwise noted. When referring to the *Ethics,* I first give the part, proposition, and then (S) scholium, (L) lemma, (D) demonstration, (A) axiom, or (C) corollary, if applicable. Thus '2p13L1' refers to Part II, proposition 13, Lemma 1. The Latin text is from the Gebhardt edition of 1925.)

[2] Cudworth (1837, vol.1, 209).

[3] I make this argument at length in my (2009).

sense of 'law,' one that is entirely disconnected from God or God's will. This branch of the way of laws antedates Descartes's work in the person of Francis Bacon, and post-dates it in that of Baruch Spinoza. Both philosophers reject the portrait of the world as an inanimate lump, dependent on God to shove it about. If I am right, Bacon and Spinoza tread a different path, one that is actively opposed to the inert mechanical conception of nature.[4] Roughly, a law of a thing's nature is the set of powers that defines that nature. Different natures have (or just are) different laws, and they can restrain and interfere with each other.

Descartes's introduction of *leges* exploits one facet of the legal analogy: the sense in which a prince or king can lay down a set of rules his subjects must obey. In just the same way, Descartes's God gives extended substance its marching orders. Bacon and Spinoza point to a different facet of the legal analogy: the sense in which laws describe what must happen in a variety of different circumstances. To fully grasp a nature like heat is to learn all of the conditionals that are true of it in virtue of its powers, and those of the natures it can encounter. By pointing to this feature of the civil law, Bacon and Spinoza decline the seventeenth century's invitation to move beyond powers and into the cadaverous world of mechanism. Fully grasping this alternative, I argue, requires us to re-think Spinoza's metaphysics of causation.

I begin by unearthing the concept in the work of Francis Bacon, who, no less than Spinoza, thinks of laws as being 'inscribed' in 'things [*a legibus in iis rebus inscriptis*], as in their true codes, according to which all singular things come to be, and are ordered.'[5] I then turn to Spinoza's

[4] My focus is on the non-human world. I am concerned with laws as they play a role in physics, as opposed to morality or the law. Donald Rutherford (2010) helpfully distinguishes between what he calls Type-I laws, which 'express natural necessity,' and Type-II laws, which depend on human decisions and have prescriptive force. Rutherford mounts an ingenious argument designed to show that Type-II laws are not an irreducibly novel category of laws but instead are 'principles of natural necessity grounded in the inherent power of the human mind' (2010, 167). Thus Type-I laws are fundamental; Type-II can be seen as a special case of natural necessity as it is worked out in the sphere of human agency. Though nothing in my analysis depends upon it, Rutherford's reading strikes me as plausible and consistent with what I say here.

[5] *Treatise on the Emendation of the Intellect*, §101 (1985, 41).

Letter 32, which, I argue, moves from what we might call the 'human image' of the physical world to its true metaphysical image. The following section explores the *Ethics*, which moves in the opposite direction: we begin with the skeletal metaphysical truth and then reconstruct the world as it appears to us in experience. Finally, I draw out the consequences of this reading for the rest of Spinoza's view.

1.

At first sight, Bacon's thoughts on laws, even with a single text like the *Novum Organon*, are a disappointing mishmash of unanalyzed jargon. He tells us that substances have laws,[6] that laws govern acts,[7] that laws are forms, which in turn are forms of natures,[8] and, to make matters worse, that forms derive natures from essences.[9] Sometimes he speaks as if laws govern simple natures like heat; at other times, as if the laws just were the simple natures; and in one startling sentence, he does both at once: 'when I speak of forms, I mean nothing more than those laws and determinations of absolute actuality which govern [*ordinant*] and constitute any simple nature, as heat, light, weight, in every kind of matter and subject that is susceptible of them.'[10]

Before sorting through all of this, we have to remove a barrier to understanding Bacon. There is a strong temptation fold Bacon into the wave of mechanical philosophers that was sweeping Europe.[11] For such philosophers, Aristotle's four causes are gradually whittled down to one: the efficient cause. All other kinds of explanation are either epistemically out of reach (the final cause, since it is impossible to know the mind of God),[12] or part of the detested hylomorphism

[6] NO II.iv: 104.
[7] NO I.li: 45, II.ii: 103, II.v: 106.
[8] NO II.ii: 102-3.
[9] NO II.iv: 104.
[10] NO II.xvii: 128.
[11] As Gaukroger (2001) tends to do.
[12] As Descartes tells Gassendi, '[w]e cannot pretend that some of God's purposes are more out in the open than others;

of the scholastics (the formal and material causes).[13] On one isotope of this sort of view, found in Robert Boyle and John Locke, the ultimate hope of natural philosophy is uncovering the micro-level structures that explain the efficient causal interactions among bodies.[14]

Reading such views back into Bacon is a mistake. Bacon opens Book II of the *NO* by endorsing the four causes of Aristotle. His reservations are actually focused on the efficient and material causes: they are 'perfunctory, superficial things, of almost no value for true, active knowledge.'[15] Knowing what something is made of, or what produces such-and-such an effect, falls short of 'true' knowledge partly because it does not help one re-produce the effect, which is the aim of 'active' knowledge. Bacon is well aware this emphasis on forms will sound odd, since he has made fun of the scholastics' empty jargon in Part I. Here is his replacement doctrine of forms:

> For though nothing exists in nature except individual bodies which exhibit pure individual acts (*'actus puros'*) in accordance with law, in philosophical doctrine, that law itself, and the investigation, discovery and explanation of it, are taken as the foundation both of knowing and doing. It is this *law* and its *clauses* which we

all are equally hidden in the inscrutable abyss of his wisdom' (AT VII 375/CSM II 258). See also Meditation Four, AT VII 55/CSM II 39. (References to Descartes are to the Cottingham, Stoothoff, and Murdoch translation (CSM) and to Adam and Tannery's edition of Descartes's work (AT).

[13] For the contraction of the four causes into efficient cause, see esp. Vincent Carraud (2002).

[14] Locke of course is skeptical that this aim could be achieved; nevertheless, when he allows himself to speculate about an idealized science, what he envisions fits my reading. For example, Locke writes, 'If we could discover the Figure, Size, Texture, and Motion of the minute Constituent parts of any two Bodies, we should know without Trial several of their Operations one upon another, as we do now the Properties of a Square, or Triangle…The dissolving of Silver in *aqua fortis*, and Gold in *aqua Regia*, would be, then, perhaps, no more difficult to know, than it is to a Smith to understand, why the turning of one Key will open a Lock, and not the turning of another' (IV.iii.25, in Locke 1689/1975, 556).

[15] NO II.ii: 102. The final cause is 'a long way from being useful' except in cases of human action.

> understand by the term Forms, especially as this word has become established and is in common use.[16]

Some commentators, such as Stephen Gaukroger, try to read such passages away, as if Bacon really meant to be talking about matter and its arrangement rather than law.[17] Such a move is unmotivated if, as I shall argue, we can in fact make good sense of these passages.[18]

When a body engages in an '*actus puros*,' it acts in a way that is not interfered with or distorted by another body.[19] Such activities will of course be the most informative about a given nature. Now, most bodies will be composites of the simple natures, such as heat. So the task of natural philosophy is to separate out these simple natures and learn their laws. Bacon conceives of laws as including clauses that detail how something possessed of the form in question will behave under such-and-such circumstances, just as a clause in statute law details how the law is meant to apply to particular cases.[20]

Note just how foreign this way of thinking is to its main competitors, whether Aristotelian or Cartesian. The scholastic notion of a form as a principle of explanation in its own right is rejected; such forms are 'figments of the human mind,' unless by 'form' one just means 'the law of act or motion.'[21] And unlike the Cartesian conception, there is no suggestion that there might be just one set of laws governing the whole universe: there are irreducibly different natures out

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[16] NO II.ii: 103. Similarly, Newton says that he takes principles like cohesion and gravity not as 'occult qualities, supposed to result from the specific forms of things, but as general laws of nature, by which the things themselves are formed' (2004, 137)
[17] See Gaukroger (2001, 140 f.) for an ingenious attempt to read away the textual evidence.
[18] For other places in NO where Bacon treats forms as laws, see, e.g., I.li: 45, II.v: 106, II.xvii: 128.
[19] As Jonathan Bennett suggests in his commentary on the passage; see his earlymoderntexts.com. For another use of the phrase, see NO I.li: 45.
[20] Jardine and Silverthorne note the analogy with statute law in Bacon (2000, 103, n.2).
[21] I.li in Bacon 2002, 45.

there, each with its own set of laws.[22] What is more important, Bacon's conception of laws is thoroughly bottom-up.

So far, Bacon's system seems unnecessarily crowded: we have natures, forms as laws, and even essences, all vying for the role of explanans. Throughout Book II, Bacon cleans up his system by collapsing some of these into others.[23] Aphorism iv tells us that form and nature always go together: when the form of heat is present, so is the nature, and when the form is absent, so is the nature. By the time he reaches xvii, Bacon has decided to identify these.

> When we speak of forms, we mean simply those laws and limitations of pure act which govern ['*ordinant*'] and constitute a simple nature, like heat, light, or weight, in every kind of susceptible material and subject. The form of heat therefore or the form of light is the same thing as the law of heat or the law of light, and we never abstract or withdraw from things themselves and the operative side. And so when we say (for example) in the inquiry into the form of heat, *Reject* rarity, or, rarity *is not of the form of* heat, it is the same as if we said, *Man can* superinduce *heat on a*

[22] Gaukroger notes that Bacon sometimes speaks of fundamental and universal laws. For example, at NO II.v, Bacon writes that the inquiries into such things as the voluntary motion of animals 'are concerned with compound natures, or natures which are joint members of a structure; and they have regard to special and particular habits of nature, not the fundamental and common laws which constitute Forms' (NO II.v: 106). Gaukroger reads this as an endorsement of 'general laws of nature' (2001, 141); Bacon's point, in part, is that it is not enough to know the general laws of nature in order to explain the motions of animals. But there is no suggestion in the text that there is a single law, or set of laws, that governs all of nature, as Gaukroger thinks. When Bacon talks about the 'fundamental and common laws which constitute Forms,' he is referring to the dispositions that constitute simple, as opposed to composite, natures. The contrast Bacon draws is between simple and composite natures, not between specific laws (say, of mechanics) and more general ones.

[23] In fact, Bacon goes further and identifies a thing with its form. See, e.g., NO II.xiii: 119, where Bacon writes, 'The Form of a thing is the very thing itself. And a thing does not differ from its form other than as apparent and actual differ, or exterior and interior…and hence it follows that a nature is accepted as a true form unless it always decreases when the nature itself decreases and increases when the nature increases.'

dense body, or on the other hand, *Man can take away heat or bar it from a* rare *body.* [24]

Forms, then, are nothing more than laws. But how can Bacon at once identify the laws with the simple nature and claim that the laws *ordinant* that nature? Clearly he can't have it both ways. The problem here is an ambiguity in Bacon's notion of a nature. In its usual use, 'a nature' is a non-dispositional feature or property that we can experience, such as light or heat.[25] Natures stand in need of explanation. This explanation might take two forms: one might give the material cause, which is the underlying stuff and its organization. In this sense, the nature *heat* is expansive motion. But as we have seen, Bacon regards this as being of relatively little interest to the natural philosopher. What counts is the formal cause, that is, the dispositions or powers. From a contemporary perspective, it is tempting to go further and claim that the dispositions described by the forms/laws are grounded in the structure of the matter in question. And that may very well be what Bacon has in mind, though it is not strictly speaking there in the text. A word for a nature like 'heat' might equally well refer to (i) the categorical property we experience, (ii) the forms/laws or dispositions that go along with that property, or (iii) the ultimate micro-structure that grounds those laws.[26]

So when Bacon says that forms/laws govern or organize a nature, he means nature in sense (iii), the micro-structure. And when he says that forms/laws constitute a nature, he means nature in sense (i), the property we experience. And, trivially, when he says that forms/laws are natures,

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[24] NO II.xvii: 128. For consistency, I am rendering '*ordinant*' as 'govern' rather than 'organise,' as this translation of NO has it.

[25] Here I ignore the difference, which Bacon registers, between heat as felt and heat as it is in the world. See NO II.xx: 131, where Bacon claims that '[h]eat as felt is a relative thing…and it is rightly regarded as merely the effect of heat on the animal spirit.' Throughout, I use 'heat' in Bacon's second sense, that is, as the non-relative nature that exists independently of its being felt.

[26] For (iii), see esp. NO I.li: 45, where Bacon recommends the study of 'matter, and its structure (*schematismus*).'

he is using the term in sense (ii). It is annoying but entirely to natural for Bacon to slide from one of these senses to another. From here on, I'll use nature in sense (i) only, as the explanandum rather than explanans.

There is a final layer of complexity. It is important, I think, to take Bacon seriously when he elects to open Book II of the NO by saying that '[t]he task and purpose of human Science is to find for a given nature its Form, or true difference…'[27] Nor is this an isolated claim; Bacon goes on to say that laws/forms act as *differentiae* which contract an 'essence' into a determinate nature.[28] A true form 'derives a given nature from the source of an essence which exists in several subjects.'[29] But what can this mean?

Since forms/laws are differentiae, Bacon must be using 'essence' to mean 'genus,' a not unnatural usage. So multiple natures can share an essence or genus; we need to find what sets one off from the other. And that something is the form/law that characterizes it. Heat, for example, is not just motion, an essence that can be shared across many natures. Heat is motion that behaves in a particular way, namely, it tends to expand. This is why forms are the *verae rerum differentiae*.

So we now have a nature (e.g., heat) whose form just is its laws, that is, the set of dispositions that characterize its behavior. Finding the form amounts to true and active knowledge because knowing those dispositions tells you how to bring it about and control it. Although there is nothing in the physical world beyond bodies and their acts, the goal of science is the discovery of forms/laws, not of the micro-structures that underwrite them. These forms are captured in propositions that describe possible states of affairs and could equally be cast as conditionals. What

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[27] '…or causative nature or the source of its coming-to-be (these are the words that we have that come closest to describing the thing)' (II.i: 102).
[28] '[A] true form is such that it derives a given nature from the source of an essence which exists in several subjects' (II.iv in Bacon 2002, 104. Bacon identifies the forms with these *differentiae*; he speaks of the 'forms or true differences of things (which are in fact laws of pure act)' (I.lxxv in Bacon 2002, 62).
[29] NO II.iv: 104.

makes these conditional or modal statements true will be the powers of the objects that figure in them. What grounds these dispositions, in turn, will presumably be matter and its structure.

While Bacon is often cast as a harbinger of mechanism, he retains something vitally important of Aristotelianism: the emphasis on the explanatory (and predictive) power of power.[30] Even if, as Gaukroger maintains, for Bacon 'the ultimate ingredients' of things are matter structured in such-and-such a way, Bacon's notion of the law of a given nature remains the ultimate ingredient of explanation and the target of scientific inquiry.[31]

Bacon's view can be illuminated by contrasting it with Descartes's. For Descartes, the laws of nature are captured by propositions such as 'each thing…always remains in the same state, as far as it can, and never changes except as a result of external causes.'[32] Such propositions are necessarily true, at least so long as the nature and will of God remain constant.[33] Descartes's notion of laws is 'top-down' in the sense that the laws flow from the nature of the divine being, not the natures of the things that 'obey' them.[34] Nothing could be further from Bacon's unrepetently bottom-up approach.

Someone might well argue that the difference between Descartes and Bacon is merely verbal: if Bacon wants to use 'law' to mean power or disposition, he is welcome to it. The orthographic similarity of the terms about which they disagree does not necessarily mark disagreement. I think this objection misses the point. My claim is that Descartes and Bacon are

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[30] 'The task of science is to find for a given nature its Form, or true difference, or causative nature, or the source of its coming-to-be' (NO II.i: 102).
[31] See Gaukroger (2001, 140).
[32] Principles II.37, AT VIIIA 62/CSM I 240-1.
[33] Descartes's thinking on modality, and the sense he gives to terms like 'necessary,' is obscure and controversial. My point here is only that, since the laws of nature follow from God's nature and will, they hold in any world where those features of God obtain.
[34] See chapter 1 of my (2009) for more on the top-down/bottom-up distinction. There, I argue at length, *pace* Hattab (this volume) and others, that Descartes's view of body-body causation has to be occasionalist. I won't repeat those arguments here.

both working with a recognizably legal metaphor. For Descartes, what counts is the arbitrariness of human laws, which are set down at will by the lawgiver. For Bacon, what counts is the structure of a statute law, with its extensive clauses designed to cover every possible case that might arise. Although either path along the way of laws can be consistent with the ontology of mechanism, they nevertheless point in different directions: top-down (Descartes) and bottom-up (Bacon). It remains now to see which path Spinoza will tread.

2.

We know from his correspondence that Spinoza read Bacon carefully. Even if he abuses Bacon when it comes to the nature of the intellect and the human mind, he also refers one of his correspondents to Bacon on just those issues.[35] And he credits Bacon, alongside Descartes, as having proved that all qualities depend on matter and motion.[36]

Bacon takes the first step away from the Aristotelian view when he trades in the scholastics' vast panoply of natural kinds for a comparatively small number of simple natures.[37] There is no way to reduce one of these simple natures to another; but learning this manageably small set of laws would amount to learning nature's alphabet, the first step to deciphering its words. Spinoza, of course, wants to go much further. The important point is that he is going much further in the same direction as Bacon, not Descartes.[38]

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[35] See Letter 37 (1666) in Bacon (2002, 861).

[36] In Letter 6 (1661) (2002, 771 f.) Spinoza says that Lord Verulam, along with Descartes, has proved that all tangible qualities depend on motion, shape, and other mechanical states.

[37] In *The Advancement of Learning*, Bacon writes, 'In the same maner to enquire the forme of a Lyon, of an Oake, of Gold; Nay of Water, of Aire, is a vaine pursuite: But to enquire the formes of Sence, of voluntary Motion, of Vegetation, of Colours, of Gravitie and Levitie, of Densitie, of Tenuitie, of Heate, of Cold, & al other Natures and qualities, which like an Alphabet are not many, & of which the essences (upheld by Matter) of all creatures doe consist; to enquire I say the true formes of these is that part of METAPHISICKE, which we now define of' (1605/2000b, 84).

[38] In less technical works, Spinoza sometimes uses 'lex' in a very Cartesian way. For example, in the *Tractatus Theologico-Politicus*, he writes that 'the universal laws of Nature according to which all things happen and are determined are nothing but God's eternal decrees, which always involve eternal truth and necessity' (2002, 417). A

Part of what makes interpreting Spinoza so difficult is the transition he asks us to make, often without an explicit invitation, between the human image – the world seen from the limited, human point of view – and the metaphysical image. The world that we live in, and which natural philosophy is suited to investigate, is replete with bodies that have distinct natures or essences (such as man, horse, and insect).[39] Seen from the point of view eternity, however, the physical world is a single substance that has only one nature, namely, extension.[40] In my view, Spinoza's Letter 32 ('The Worm in the Blood') enacts for us the transition from the manifest image to the metaphysical image, where bodies constitute a single super-individual, what Spinoza elsewhere calls 'the face of the entire universe.' Spinoza's *Ethics* takes us in precisely the opposite direction. There, Spinoza begins with the metaphysical image and goes on to show how the human image can be reconstructed. There is no question but that the metaphysical image is fundamental. The challenge for Spinoza is to explain why the world as we experience it seems so very different.

In this section, I focus on Letter 32. Here we travel from a human image, one that is recognizably Aristotelian, through a Baconian view, and end up finally with the world as it is in itself. Letter 32 illustrates how one might start by thinking of the world in terms of powers and or natures and end with an ontology that has room for only one nature and the patterns it produces.

In this letter, Spinoza responds to a question from Oldenburg: 'how [do] we know how each part of Nature agrees with the whole to which it belongs and how it coheres with the others'?[41] Whatever Oldenburg means by 'coherence,' Spinoza stipulates that '[b]y the coherence of parts,

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bit later, however, he makes it clear that he is speaking analogically: 'Still, it seems to be by analogy that the word law is applied to natural phenomena, and ordinarily 'law' is used to mean simply a command which men can either obey or disobey, inasmuch as it restricts the total range of human power within set limits and demands nothing that is beyond the capacity of that power' (2002, 427). But Spinoza's real view is even more distant from the Cartesian picture, since of course he rejects the whole notion of a God who stands outside of nature and sets out his 'decrees.'

[39] See, e.g., the Preface to Part IV of the *Ethics*.

[40] The one substance of course has an infinite number of attributes, of which we know only two, thought and extension.

[41] Spinoza (1994, 82).

then, I understand nothing but that the laws *or* {*sive}* nature of the one part so adapt themselves to the laws *or* nature of the other part that they are opposed to each other as little as possible.'[42]

Spinoza begins by insisting that we do not know *how* this happens, though we do know *that* it does. Even if there is only one substance, the natural world still seems, from the human point of view, to be divided into parts:

> Concerning wholes and parts, I consider things as parts of some whole insofar as the nature of the one so adapts itself to the nature of the other that so far as possible they are all in harmony with one another. But insofar as they are out of harmony with one another, to that extent each forms an idea distinct from the others in our mind, and therefore it is considered as a whole and not a part.[43]

Whether a mereologically neutral 'thing' is a whole or a part is a function of harmony and coherence. When we consider two things as two, that is, as two wholes, that is because their disharmony produces two distinct ideas in the mind. Now we know that disharmony is ultimately an illusion, as is the two-ness of the two, or the *n*-ness of the *n*. Nevertheless, at this initial stage, we attribute distinct and competing natures and laws, that is, distinct powers, to distinct parts of the natural world.

We can now confront the central puzzle of Letter 32: what could Spinoza mean by speaking of the laws of a thing's nature? Once we see the Baconian context, and construe laws as powers, Spinoza's text comes into focus. The laws of a thing's nature just are the powers it has. This is

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[42] Spinoza (1994, 82). Note that Curley's italicized 'or' translates *sive*, which indicates an equivalence rather than an alternative.
[43] 1994, 82-3.

why Spinoza can speak indifferently of laws *or* natures and laws *of* natures. Either way, what makes heat *heat* is what it does in such-and-such circumstances.

Spinoza tells us that the laws of different objects 'restrain' each other.[44] Such a pronouncement is incoherent on the Cartesian understanding of laws: the laws are universal and unitary. But if laws are powers, it makes perfect sense: the powers of distinct objects can compete against each other. The blood might be disposed to move in a certain direction, but this disposition can be interrupted, if you like, by the presence of competing causes. In just the same way, a match can be disposed to light when struck, and yet not light in an oxygen-free environment. Any given event, then, will be the result of the interplay among the laws or dispositions of the objects concerned.

Such a view has some striking affinities with Aristotelian thought. The nature of fire, on such a view, is a disposition to burn things. But whether anything actually is burned is a function partly of the passive powers possessed by the objects with which fire comes into contact. An Aristotelian science is occupied with discovering these natures or powers and mapping out their interactions.

To illustrate this stage, Spinoza introduces an analogy. He asks us to imagine things from the point of view of a little worm living inside the veins of another creature. To us, the particles that make up blood (lymph and chyle, for example) are parts of the blood. But to a worm swimming in the blood, endowed with the capacity to distinguish these particles, lymph and chyle are not parts but wholes. Spinoza writes,

[44] 'There are a great many other causes which restrain the laws of the nature of the blood in a certain way, and which in turn are restrained by the blood, it happens that other motions and other variations arise in the particles of the blood…' (1994, 83).

> [The worm] would live in this blood as we do in this part of the universe, and would consider each particle of the blood as a whole, not as a part. Nor could it know how all the parts of the blood are restrained by the universal nature of the blood, and compelled to adapt themselves to one another, as the universal nature of the blood requires, so that they harmonize with one another in a certain way.[45]

The worm, it seems, is missing out on two things. First, it cannot see how the particles, which it regards as wholes, are themselves parts of the blood and so are 'restrained by' the nature of the blood. The explanation for how the lymph particle behaves involves the nature of the blood as a whole. Just as we do (at least before we come to realize the truth), the worm sees every variation in powers as a mark of a new whole, a new and complete object, endowed with a novel set of powers. The Aristotelian watching fire burn paper has done the same thing.

Second, the worm has no way of knowing that there is anything beyond the blood. And just as the particles of the blood 'adapt themselves' to one another, so the blood itself is adapted to or harmonizes with the body of which it is a part. And of course beyond the human body itself there are many other things that affect the blood, whether directly or indirectly.

Spinoza sums up the point of his example in this way:

> Now all bodies in Nature can and must be conceived as we have here conceived the blood, for all bodies are surrounded by others, and are determined by one another to existing and producing an effect in a certain and determinate way, the same ratio of motion to rest always being preserved in all of them at once, that is, in the whole

[45] 1994, 83.

> universe. From this it follows that every body, insofar as it exists modified in a certain way, must be considered as a part of the whole universe, must agree with the whole to which it belongs, and must cohere with the remaining bodies. And since the nature of the universe is not limited, as the nature of the blood is, but is absolutely infinite, its parts are restrained in infinite ways by this nature of the infinite power, and compelled to undergo infinitely many variations.[46]

What we call 'bodies' are not wholes but parts of the entire universe. An infinite mind would stand to all bodies as we stand to the blood. Our grouping of the modes we experience into bodies is a function of our benighted epistemic state; what is real is only the single substance.[47] And our belief that they exhibit genuinely different powers is also an illusion: since all (physical) modes are modes of extension, they share a nature, and their behavior is fully explicable by that single nature.

Thus Letter 32 presents a pathway by which one might navigate from a naïve initial position – roughly the Aristotelian view – to a metaphysically sound, Spinozistic view. We begin with the claim that the physical world is exhaustively characterized by a single attribute, viz., extension. For the various Aristotelian natures, with all their attendant and competing powers, we substitute a single nature and a single set of dispositions and powers.[48] One can then identify the laws *of* nature with that nature. And if one takes the further step and treats bodies not as substances

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[46] 1994, 84.

[47] Spinoza's thoughts here are very much in line with 2p13l7, where he argues that 'the whole of nature is one individual, whose parts, that is, all bodies, vary in infinite ways, without any change of the whole individual.' For more on how the parts can vary while the whole stays the same, see esp. Tad Schmaltz (1997). For our purposes now, the important part is the notion that what we call bodies are parts of a single super-individual.

[48] I am not, of course, suggesting that *The Worm in the Blood* invokes Aristotelian forms. Instead, it is clearly their mechanical substitutes Spinoza has in mind: the exercises of the dispositions of the worm and the blood are to be understood exclusively in terms of motion-and-rest.

but as modes, then physical events can be seen as the working-out of a single nature of a single substance, across merely epistemically distinct bodies.

3.

If Letter 32 moves from the human to the metaphysical image, the *Ethics* moves in just the opposite direction: Spinoza begins in Part 1 with the core notions of his metaphysics. It is left to the other Parts to restore, bit by bit, the human image. For our purposes, it will thus be better to read the *Ethics* backwards, working from the roughly Aristotelian picture back to the true metaphysical one.

In Parts Three and Four, we find Spinoza happily attributing different essences to man, insects, and horses, even though we know he cannot really be serious. The next level is exhibited by the so-called Physical Digression of Part II. There, Spinoza is closest to Bacon, winnowing the lineup of distinct essences down to a limited number of forms such as hard, soft, and fluid. Finally, when we turn back to Part I, we will find all of this talk falls away, and the one substance and the laws of its nature, that is, its power, emerge as the fundamental notions of Spinoza's metaphysics.

Salted throughout the final parts of the *Ethics*, one can find unapologetically Aristotelian language. Perhaps the most important comes in the preface to Part IV, where Spinoza writes,

> [W]hen I say that someone passes from a lesser to a greater perfection, I do not understand that he is changed from one essence, or form, to another. For example, a horse is destroyed as much if it is changed into a man as if it is changed into an insect.

Aquinas would not have blushed to write this. Forms are migration barriers; nothing can pass from one to another without being destroyed. At this human level, forms and essences are the same thing. What that thing is remains obscure. In a way, that is no surprise, for this everyday notion of form/essence must be re-figured as we ascend closer to the truth of things.

Aristotelian forms have to be analyzed away. In Part III, Spinoza gives us the tools to do so:

> 3p6: 'Each thing, as far as it is in itself, endeavors to persist in its own being.'[49]
>
> 3p7: 'The striving by which each thing strives to persevere in its being is nothing but the actual essence of the thing.'

The *conatus* or striving is not something added on to a thing, or something it has only because God moves it about in a certain way. It is the essence of the thing. Since physical things are not substances but modes, their essences are in the end modifications of the attribute of extension. The terminology is tangled but the point should be clear: that bodies strive to persist in their own being is part of what it is to be a body.

To make sense of this, we have to invoke Part II's Physical Digression (2p13). We know from the Definitions at the beginning of that Part that an essence is something the positing of which is both necessary and sufficient for the thing's being posited.[50] The Physical Digression reveals

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[49] Here again I depart from Curley, who renders 3p6 thus: 'Each thing, as far as it can, strives to persevere in its being by its own power.' As Deborah Brown pointed out to me, nothing in the text justifies Curley's use of 'power': '*Unaquaeque res, quantum in se est, in suo esse perseverare conatur.*' There is also a philosophical problem in the interpretation of this proposition. As it stands, it allows that things sometimes *don't* strive to persevere in being; but 3p7 makes such striving the essence of a thing. Michael Della Rocca (1996, 200) suggests we read 3p6 as saying that each thing *will* persevere in being, so far as it can. It's the persevering, not the striving, that external forces can prevent.

[50] 2pd2.

that what individuates composite bodies is their differing ratios of motion and rest.[51] If we identify what makes an individual the individual with its essence, we can say that the essence of, say, a horse or a tree is its striving to maintain the same ratio of motion and rest.[52] Presumably, if it fails in this task, it then disintegrates into its constituent simple bodies.

What makes 2p13 so hard to grasp is the fluidity of Spinoza's jargon. At times, he appears to use 'form' or 'nature' interchangeably, where both mean Aristotelian forms.[53] The Physical Digression, then, is meant in part as a respectably mechanist reduction of Aristotelian forms to ratios of motion and rest. So far, so good. But there is also reason to think Spinoza is using these terms to mean something like macro-level property or state. Hard, soft, and fluid, are forms, according to Spinoza, and 'natures' according to Bacon.[54] Unlike Aristotelian essences, things can gain and lose these forms without being destroyed.[55]

We have not yet reached the metaphysical image. That is the work of Part I. Not surprisingly, or so I shall argue, Spinoza uses the notion of law to make the transition.

After establishing that God exists (1p11) and is the only substance (1p14), Spinoza has to explain how a single substance can be responsible for the diversity we see around us. His answer is precisely what you get when you combine Bacon's understanding of laws with monism:

1p16: 'From the necessity of the divine nature there must follow infinitely many things in infinitely many modes...'

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[51] '*Bodies are distinguished from one another by reason of motion and rest, speed and slowness, and not by reason of substance*' (2p13L1).
[52] As Nadler (2006, 195) helpfully points out.
[53] See esp. 2p13L6 and L7.
[54] See *Ethics* 2p13and NO II.xxv: 140.
[55] Spinoza speaks of the experience and knowledge we derive 'from observing [things outside us] and changing them from one form into another' (Appendix to Part IV, section xxvii).

1p17: 'God acts from the laws of his nature alone, and is compelled by no one.'

Just as the definition of a triangle entails properties like *having angles that sum to 180 degrees*, so a nature like extension will logically imply an infinite number of properties. If among these properties are finite modes, we have some notion of how the attribute of extension might generate bodies, i.e., finite modes.

In these propositions, we begin to see just how far Spinoza is from the Cartesian concept of extension. Spinoza's extension is not a cadaverous thing awaiting a divine shove; it is active of itself.[56] Note how Spinoza puts it when it comes time to say how God acts: he acts '*solus suae naturae legibus*,' from the laws of his nature alone. As in Letter 32, Spinoza's point is that there is no competing substance with a different nature, whose laws (that is, powers or dispositions) could interfere with God's. Without the Baconian background, it is impossible to read 1p17 as anything other than a long printer's error.

Later on in the *Ethics*, Spinoza again uses the notion of law to knit together the human and metaphysical images:

> …Nature is always the same, and its virtue and power of acting ['*virtus et agendi*'] are everywhere one and the same, that is, the laws of nature and the rules according

[56] Tschirnhaus (Letter 80) pressed Spinoza on just how extension by itself could entail all the infinity of finite modes that are supposed to follow from its nature (E1p16). In answer, Spinoza distances his concept of extension from that of Descartes: '[F]rom Extension as conceived by Descartes, to wit, an inert mass, it is not only difficult, as you say, but quite impossible to demonstrate the existence of bodies. For matter at rest, as far as in it lies, will continue to be at rest, and will not be set in motion except by a more powerful external cause. For this reason I have not hesitated on a previous occasion to say that Descartes's principles of natural things are of no service, not to say quite wrong' (Letter 81). In Letter 83, Spinoza adds that 'matter is badly defined by Descartes by means of Extension' and that 'it must necessarily be explicated by means of an attribute that expresses eternal and infinite essence' (Quoted in Schmaltz 1997, 220.) That doesn't take us very far toward understanding Spinoza's notion of extension, but it does mark his view off from Descartes's.

> to which all things happen,[57] and change from one form to another, are always and everywhere the same. So the way of understanding the nature of anything, of whatever kind, must also be the same, namely, through the universal laws and rules of Nature.[58]

Change in form is to be attributed to the laws of the one nature that is instantiated in the physical world. And since there is but the one nature, there is only one set of laws, that is, one set of dispositions or powers.

The contemporary ear is tempted to seize on Spinoza's talk of 'the universal laws and rules of nature' and rush to one of the contemporary analyses of laws of nature on offer. That would be a mistake. The question is, in which direction does the reduction run: is it from laws to powers, or the other way around?[59] What we have already established should make the choice clear: talking of laws or rules is just talking of powers or dispositions.[60] And just as 1p16 and 1p17 claim, there is only one nature in nature, namely, extension; hence its powers are uniform and can never encounter a competing nature that might disrupt it.

But it is not just his overt claims that force us to read Spinoza's laws as powers or dispositions. His practice, when it comes time to prove propositions Descartes would happily call

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[57] Here I depart slightly from Curley's translation. As he has it, Spinoza says that 'the laws and rules of nature, according to which all things happen, are everywhere the same.' I can understand the desire to avoid repetition, but it might be significant that the Latin phrase is '*naturae leges et regulae secundum quas omnia fiunt*,' that is, 'the laws of nature and the rules according to which all things happen.'

[58] Cp. *Treatise on the Emendation of the Intellect*, section 101.

[59] Curley reads the passage as indentifying 'the laws of nature and nature's virtue and power of acting' (correspondence, reported in Melamed (2009, 25); cp. Curley (1969, 49) and (1988, 42-3)). On Curley's view, nature's agency amounts to nothing more than its being rule-governed. That is at best backwards and at worst nonsensical (since Spinoza does not have the Cartesian, governing conception of laws).

[60] See Melamed (2009, 25-6) for a selection of possible competing readings of this obscure passage. Melamed modestly concludes that 'the textual source appears too equivocal to support the bold suggestion that God is the most general law (or principle) of nature' (26).

leges, also supports this reading. In the Physical Digression of 2p13s, Spinoza 'premise[s] a few things concerning the nature of bodies.' What follows are a set of axioms and lemmas; Spinoza never calls them *leges*. These propositions follow from the nature of body.

Consider how Spinoza proves Lemma 3, which states, in part, that a body that moves or is at rest must be determined to do so by another body, and so on to infinity. Bodies, Spinoza argues, are individuated by motion or rest (2p13L1).[61] Since each finite mode has another finite mode as its cause (1p28), and since we have ruled out cross-attribute causation, a particular body's motion-or-rest must have as its cause another body. Given the way bodies are individuated, we can infer that this body itself must be in a state of motion-or-rest. And we can then run the same argument: there must be yet another body to account for its motion-or-rest, and so on *ad infinitum*.

By contrast, Descartes offers to prove a closely related proposition by appeal to God's nature and activity. His first law in the *Principles* states that 'each thing, in so far as it is simple and undivided, always remains in the same state, as far as it can ['*quantum in se est*'], and never changes except as a result of external causes.'[62] Putting it that way suggests that there is something in the body that explains its persistence in the same state. But Descartes explicitly says that the reason this law obtains lies in 'the immutability and simplicity of the operation by which God preserves matter in motion.'[63] What is moving is not nearly as important to the law as by whom it is being moved. When Spinoza uses the same phrase ('*quantum in se est*') in 3p7, he might well be self-consciously inverting Descartes's position.

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[61] Note that we are dealing with simple bodies (i.e., those individuated solely by motion-or-rest), not composite bodies – which are only introduced at the end of A2'.' It is also important to note that the natures of body that Spinoza speaks of in A3'' and following are not Aristotelian natures but merely hard, soft, or fluid characteristics, all of which are explained by mechanical means.

[62] Principles II.37 (AT VIIIA 62/CSM I 240-241).

[63] Principles II.39 (AT VIIIA 63/CSM I 242).

4.

By now, it should be clear that Spinoza has nothing like a Cartesian concept of *leges naturae*, nor the contemporary concept of laws of nature that descends from it. At times, in writings less technical than the *Ethics*, Spinoza is happy to speak of laws as if they were divine decrees. But when he is being careful, it is clear that laws of nature are powers or dispositions.

What might justly be called the dominant reading of Spinoza on laws, however, imports a contemporary conception of laws as general facts that govern the behavior of objects in the universe. In their different ways, Edwin Curley, Jonathan Bennett, and Jon Miller subscribe to what we might call this 'general facts' view.[64] It is worth briefly canvassing this view as a foil to bring out what is distinctive about my Baconian interpretation.

The best way to see the appeal of the general facts view is by considering the puzzle it is meant to solve. Spinoza distinguishes between finite and infinite modes. Among the latter, we can also distinguish mediate and immediate infinite modes, depending on their relationship to the attribute in question. The immediate infinite mode under attribute of extension is, according to Letter 64, motion and rest; the mediate infinite mode is said, in a notoriously obscure phrase, to be *facies totius universi*, or the face of the entire universe. The challenge is to see how any of these infinite modes can be related to finite modes.

All modes whatsoever must follow from the infinite modes:

[64] On the question of laws, I believe Curley's interpretation deserves to be called the 'orthodox' position in the literature. Both Steven Nadler (2006) and Michael Della Rocca (2008) mention Curley's position on laws of nature as a solution to a number of interpretive problems, though both stop short of fully endorsing it. Jonathan Bennett (1996, 73) writes, '[W]hat could such features [viz., 'features of the extended world that it instantiates always and everywhere'] be? The only convincing answer to this that I know of is Curley's. He says that infinite modes are causal features of the world, and a statement attributing such a mode to the world would be a basic causal law.' Other proponents of the Curley solution include Jon Miller (2003).

1p23: ‘Every mode which exists necessarily and is infinite has necessarily had to follow either from the absolute nature of some attribute of God [an immediate infinite mode] or from some attribute, modified by a modification which exists necessarily and is infinite’ [a mediate infinite mode].

And yet every finite mode follows from another finite mode:

1p28: ‘Every singular thing, or any thing which is finite and has a determinate existence, can neither exist nor be determined to produce an effect unless it is determined to exist and produce an effect by another cause, which is also finite and has a determinate existence.’

The general facts reading has an elegant solution to this problem. If we assume that Spinoza’s laws are general facts that govern particular facts, we can say at the same time that any individual finite mode follows from the infinite modes, in the way that a particular fact follows from a general one, *and* that each finite mode is produced by another such mode. Curley’s scheme looks like this:

Attribute of extension: the ‘basic’ nomological facts

Immediate infinite mode of extension: derivative but primary nomological facts

Mediate infinite mode: derivative and secondary nomological facts

Finite modes: singular facts.[65]

So on Curley's view, a finite mode, plus a law of nature, cooperate to produce a new finite mode.

Even those who do not explicitly endorse all of Curley's views are friendly to his reading of laws. Jon Miller, for example, writes, 'laws are real members of the world and they (along with the series of causes of which all finite modes are members) directly determine all that comes to happen or exist.'[66] Curley goes further: Spinoza '*identified God with Nature, not conceived as the totality of things, but conceived as the most general principles of order exemplified by things*.'[67]

There are many reservations one might have about this interpretation. If monism just amounts to the claim, 'there is only one set of general principles,' it is hard to see why anyone would object. Nor is there much ground for thinking that modes of any kind are facts. Nor is there any compelling textual basis for treating motion and rest, for example, as derivative nomological facts as opposed to motion and rest. The key to finding our way out of the problem posed by 1p23 and 1p28 is to see, with Richard Mason, that the relation between infinite and finite modes 'was not meant to be a causal one' in the first place.[68] Once we stop assuming that the sense in which finite modes follow from the infinite ones has to be causal, we can see our way clear to a reading more grounded in the text.

Let's begin with the immediate infinite mode of extension. Spinoza tells us it is motion-and-rest.[69] Recall that an immediate infinite mode is 'the mode which, in order to exist, needs no

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[65] Adapted from the chart given by Curley (1969, 63). In epistemic terms: '[W]e can look on the fundamental laws of nature not only as principles which explain whatever happens in nature, but also as principles which could not, by their very nature, be explained by anything else' (Curley 1988, 44).
[66] Miller (2003, 266).
[67] 1988, 42; italics in original.
[68] Mason (1986, 204).
[69] In the *Short Treatise*, Spinoza claims that the infinite mode (there is no mention of mediate as opposed to immediate modes) in extension is simply matter (1994, 85). If, as I shall argue, the (immediate) infinite mode of extension underwrites the production of finite modes, it makes sense that he adds 'rest' to the mix.

other mode in the same attribute.'[70] Given Spinoza's nominalism, we should not read him as here implying that there is a Platonic universal, motion-and-rest, that emanates from the attribute of extension. Instead, this is a claim about extended things: *any* extended thing will, solely in virtue of being extended, be either in motion or at rest.

What are we to make of the famously obscure mediate infinite mode of extension, *facies totius universi*? The most natural reading of the phrase, at first glance, takes it to be simply the sum total of every extended 'thing,' i.e., the aggregate of all finite modes of extension.[71] In other words, it is the super-individual of 2p13 and of Letter 32.[72]

Now, a mediate infinite mode should depend on nothing but the *immediate* mode. Putting all this together, we have the claim that the sum total of all finite modes of extension depends on nothing but motion-and-rest. And this is unsurprising, since Spinoza's bodies are individuated by motion and rest. We need appeal to nothing other than motion-and-rest to explain the face of the entire universe.[73] So although the finite and infinite modes do not causally cooperate, they do stand in dependence relations, and that is all we need to make sense of 1p23 and 1p28.

5. Conclusion

The way of laws is not just crooked but forked. Pursued in one, broadly Cartesian, direction, it leads to occasionalism. For this top-down approach divorces laws from the things that

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[70] As Bennett reminds us (2001, v.1, 171); the quotation is from Spinoza's *Short Treatise* (1661) in Spinoza (1985, 153n).

[71] See Mason (1986, 205-7) for a fuller defense of this point. As Mason acknowledges, Spinoza is on shaky ground when he supposes that a mere aggregate of infinite modes could itself be infinite.

[72] I owe this point to Tad Schmaltz (1997).

[73] So construed, Spinoza's point would be analogous to Descartes's claim in *Le Monde* that God can, simply by producing motion, create the world as it appears to us (CSM I 91/AT XI 34-5). Spinoza's point differs from Descartes's, however, in two key respects: a) Descartes appeals to the laws of nature to explain the order and perfection of the universe, and b) Descartes thinks matter would be arranged in such a way as to 'have the form of a quite perfect world.'

obey them. The immediate question is: what is responsible for the enforcement of the laws? The only candidates for that role in the early modern period are Descartes's God and Newton's mysterious 'agent acting constantly according to laws.'[74] I have been trying to unearth a distinct notion of law that retains its legal flavor but ties it to objects and their powers.[75] For Bacon and for Spinoza, nature takes the course it does because it has the powers, that is, the laws, that it does. There is no lawgiver; there is only power.

For both Bacon and Spinoza, laws are inscribed in things. They take the very same legal metaphor Descartes does but preserve a different aspect of it. Where Descartes retains the air of arbitrariness the metaphor conveys, claiming that it is God's nature and not that of creatures that determines the laws, Bacon and Spinoza appeal to laws to bring out the multi-faceted ways in which objects and powers interact. To call a thing's powers its laws is to emphasize at once its enduring and unchanging capabilities and the conditional status of their exercise. In this respect, Bacon and Spinoza have more in common with their predecessors than their immediate successors.

That the notion of laws as powers looks backward rather than forward will be seen by some as a point against my reading.[76] To this there are two replies. First, the fact that some philosophers should try to defend parts of a worldview that was quickly becoming outmoded is neither surprising nor something to be apologized for. What is more important, while their fellow

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[74] See the Letter to Bentley of 25 February 1692/3, in Newton (2004). Newton argues that 'it is inconceivable that inanimate, brute matter should, without the mediation of something else, which is not material, operate upon and affect other matter without mutual contact…' (2004, 102). 'Gravity must be caused by an agent acting constantly according to certain laws; but whether this agent be material or immaterial, I have left to the consideration of your readers' (2004, 103).

[75] This use antedates even Francis Bacon. It occurs in Roger Bacon's *Opus Majus* of 1267, where we find the claim that the transmission of disease 'is thus an amazing power, since everything happens in accordance with its laws, both hidden and manifest' (1267/1928, vol.1, 163).

[76] Considering something like the view I defend, Richard Manning (2012) argues that 'Another, related problem for this interpretation is that it represents Spinoza as, not an avant-garde thinker anticipating modern physics, but as a rear guard defender, despite his official anti-scholastic stance, of the traditional neo-Aristotelian doctrines of essence and substantial form, open to the same charges of ad hoc theorizing and appeal to occult powers that Modernity and the Scientific Revolution leveled against it in its their rise to intellectual dominance.'

philosophers in the modern period largely abandon the powers-based ontology, it has experienced a resurgence in the last forty years or so. Indeed, contemporary authors such as Brian Ellis speak of a power's 'law of action,' which 'describes the kinds of changes that must result when the causal power is activated in circumstances of the appropriate kind.'[77] Ellis is reproducing, if unconsciously, the very concept of law we have recovered. Seen from this wider historical perspective, it is the Cartesians who are clinging to a doomed raft, not Bacon and Spinoza.[78]

[77] Ellis 2002, 172.

[78] I would like to thank Galen Barry, Michael LeBuffe, Jim Darcy, Mason Pilcher, and especially Antonia LoLordo for helpful comments. An earlier version was presented at as a keynote address to the Rotman Summer Institute, 'Causal Powers in Science: Blending Historical and Conceptual Perspectives,' in July of 2014. I am very grateful to the conference organizer, Henrik Lagerlund, for the invitation to speak. The paper benefited from many comments and criticisms, especially those of Deborah Brown, Jennifer McKitrick, and Calvin Normore.