The Priority of Natural Laws in Kant's Early Philosophy

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Abstract: It is widely held that, in his pre-Critical works, Kant endorsed a *necessitation* account of laws of nature, where laws are grounded in essences or causal powers. Against this, I argue that the early Kant endorsed the priority of laws in explaining and unifying the natural world, as well as their irreducible role in in grounding natural necessity. Laws are a key constituent of Kant's explanatory naturalism, rather than undermining it. By laying out neglected distinctions Kant draws among types of natural law, grounding relations, and ontological levels, I show that his early works present a coherent and sophisticated laws-first account of the natural order.

One of the most influential innovations of Kant's Critical system is his emphasis on non-empirical laws, such as the moral law and transcendental principles of the understanding. Rather than advance a detailed theory of empirical laws, Kant generally tends to begin with their *prima facie* reliability and look for the conditions that make this possible. And even regarding the conditions for the necessity and objectivity of empirical laws, there is no consensus among commentators.

But Kantian philosophy does not begin with the first *Critique*. Given the lack of agreement on his mature theory, it is natural to hope that Kant's earlier philosophical works—prior to his transcendental turn, and published while Kant was directly engaged in first-order scientific research—can shed light on the status of empirical laws.

On a widely shared interpretation, however, such hopes are mostly misguided. This reading contends that, while Kant may frequently speak of laws in his early work, his underlying metaphysics in this period focuses not on laws but on the natures and causal powers of created things.[1] Natural necessities, as well as the general truths expressed by laws, are supposed to be grounded in powers and natures. Laws then bear little or no metaphysical weight, however convenient it may be to posit them. This is often called a *necessitation account* of laws, but the point is that laws are necessitated; they do not necessitate.

Now, I do think this reading is on to something. Even early on, Kant insists on the active causal powers of material substances (unlike Cartesians), and sets strict limits on God's direct role in grounding causal patterns in nature (unlike Newtonians and Wolffians). Yet Kant's rejection of *some* laws-first ways of explaining the natural order need not involve rejecting *all* of

[1] See Watkins (2005, 406), Kreines (2008), Massimi (2014, 504), Massimi (2017, 160), Messina (2017), and Engelhard (2018). It is noteworthy that Breitenbach (2018, 111–114), who does not defend a necessitation reading of the *Critical* Kant, accepts the correctness of this reading for the pre-Critical Kant. Readings closer to the one I defend here—but not developed in detail—are suggested by Langton (1998), Laywine (2006), and Huxford (2018).

them. And when we look at Kant's pre-Critical texts, the sheer number of references to laws of nature is overwhelming. The twelve-page preface to Kant's *Universal Natural History*, for example, mentions laws twenty-six times.

Here and elsewhere, Kant does not focus on showing how laws are reducible to powers or natures, but straightforwardly portrays them as governing natural causal powers, which are at least apparently distinct from the laws themselves (e.g. *UNH* 1:274). Such passages put pressure on necessitation readings either to regard Kant's early writings as presenting an Aristotelian metaphysics of powers in a veiled or even esoteric way, or as internally inconsistent. These are interpretive choices of last resort.

This paper presents an alternative reading, on which, for the pre-Critical Kant, laws of nature cannot be reduced to the local natures of substances. One job for these laws is to provide unity for nature—unity that is not just explanatory but ultimately metaphysical in character. Additionally, the laws play an irreducible role in grounding natural necessities.

On my reading, the early Kant can endorse this metaphysically substantive role for laws while also allowing matter to be active and causally efficacious. Natural necessities, in particular, are partly grounded in individual created substances. Far from committing the early Kant to an excessive reliance on divine action, metaphysically independent laws circumscribe nature as an explanatory domain, though one that is ultimately metaphysically dependent on God.

The general plan for this paper is as follows. Section 1 gives a preliminary taxonomy of Kant's key metaphysical concepts. I then lay out Kant's account by focusing on two successive phases of his early writing. In section 2, I consider how Kant's basic account of laws is already in place in works from around 1755, particularly the *New Elucidation*. I then turn to the early 1760s. As I explain, while Kant's views on which laws do what work have shifted, he remains committed to his core laws-first account. He places new emphasis on the least action principle as a metaphysical and explanatory unifier, as I discuss in section 3. And in section 4, I argue that both global and local natural necessities are partly grounded in general laws on Kant's view.

1. Preliminaries: Natures, Powers, and Laws

In this section I sketch how the early Kant conceived of natures, causal powers, and laws. Doing so will establish a vocabulary for articulating my account. At this stage, I attempt to lay out Kant's concepts as neutrally as possible.

Before proceeding, let me make a couple of methodological points. The full story of Kant's development on this topic up to the first *Critique* is beyond the scope of this paper. My aim is instead to systematically lay out central features of Kant's distinctively pre-Critical account of law. I broadly agree with Dieter Henrich (1967) that Kant had developed a consistent and complex early philosophical system by the early 1760s, but that his views transformed significantly in the second half of the decade and in the 1770s. So, while I consider some earlier texts, much of my focus will be on texts from around 1763, especially the *Only Possible Argument*.

Especially in the current section, I also cite later passages that corroborate and elaborate on Kant's earlier ideas. These passages provide evidence that at least some of Kant's metaphysical terminology remains stable well beyond the mid-1760s. To be clear, it would be possible to reject this evidence while accepting my account of Kant's position during the period 1755–1763, as well as my overall interpretation of laws of nature during this period. In other words, the later texts provide supporting but not essential evidence for my reading of the early Kant.

Accordingly, I only selectively discuss the literature on Kant's Critical account of laws. That literature has traditionally engaged in detail with Kant's distinctive Critical commitments to constitutive principles of the understanding and regulative principles of pure reason.[2] An exception to this pattern is a strand of radical necessitation readings, like the one offered by James Messina (2017). These readings are to apply to both the pre-Critical and Critical Kant, so what I say about them here may also have some relevance for debates on Kant's later conception of laws.

Another methodological point concerns Kant's development within the pre-Critical period I focus on here. In the current section, I focus on basic concepts that I take to remain more or less stable across this period. Many of these concepts are laid out in Herder's notes on Kant's metaphysics lectures (from the early 1760s), but can also be found in earlier texts. In subsequent sections, I turn to further details of Kant's position. In particular, I home in on some substantive developments in Kant's thought within this period—for example concerning the explanatory power of Newtonian physics—without claiming to treat the evolution of Kant's ideas in full.

Let us begin, then, by considering what Kant means by *natures*. Kant distinguishes between three senses of 'nature': (1) 'nature' as a mere sum of observed phenomena; (2) these phenomena insofar as they are determined in an ordered or regular way by general laws; and (3) the *natures* of things of a certain kind, for example, the nature of extended bodies.[3] So natures in sense (3) are in the first instance properties of particulars rather than universals.

We can then ask how these senses of 'nature' are related, and identify grounding relations among them. Roughly, necessitation accounts seek to reduce the general lawlike character of nature in sense (2) to nature*s* in sense (3). There are various ways carrying out such a reduction, as I'll discuss below: grounding can be epistemic or explanatory as well as metaphysical.

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[2] For what it's worth, I agree that any adequate account of laws in the Critical period will need to discuss these transcendental principles. This point is also granted by advocates of what might be called moderate necessitation readings, e.g. Stang (2016, 200–13; 228–59) and Engelhard (2018). *Which* Critical transcendental principles play a role in explaining empirical laws, and how they do so, is itself a matter of debate: see for example Buchdahl (1971) and the survey of more recent literature in Breitenbach (2018).

[3] For ease of exposition, I am drawing on Kant's 1770s terminology: e.g., *LM-L$_1$* 28:215–216, 28:221, 'ID' 2:406–7, and *Refl. 4439* 17:547, dating from 1771. However, the early 1760s metaphysics lectures already distinguish (at least) between *a* nature that bears "powers" and "the unity of nature," i.e., nature as a collective whole (*LM-H* 28:15; 28:49). In turn, the 1763 *Only Possible Argument* draws a distinction, regarding nature in a collective sense, between the phenomenal 'course of nature' and the law-governed 'order of nature' (*OPA* 2:108–9; 2:103). In fact, the underlying distinctions may already be in place in the 1750s: see section 2.

To understand necessitation readings, then, it is important to get clear on what Kant means by a nature in sense (3). He describes the nature of a thing as its "principle of effectiveness" that "grounds…alteration" and "concerns power and activity [*Thätigkeit*]," and even suggests that "the essential power…*is* the nature of the thing" (*LM-H* 28:49; emphasis added). The nature of a thing is closely connected or even identical to its causal profile. Thus Kant denies, both in early works and in the Critical period, that mathematical entities have natures—while granting that they have essential properties (*LM-H* 28:49, *LM-L*$_1$ 28:211; *MFNS* 4:467).

Broadly speaking, then, Kant characterizes a thing's nature in terms of its causal powers. A nature can be characterized more precisely in terms of two cross-cutting distinctions. Kant draws one distinction between *actualized powers* or forces that contain "the ground of the actuality" of a change, and capacities or faculties (*Vermögen*) that only ground possible changes (*LM-H* 28:24–7; *LM-Mr* 29:823).[4] Rae Langton (1998) has plausibly argued that Kantian capacities are intrinsic properties. Such capacities need not be exercised and so are distinguished from actualized causal powers. By contrast, at least in the physical or material world the actualization of powers depends on extrinsic circumstances of causal *inter*action. (I'll return to this point below.) Kant's terminology, then, differs from some of the recent metaphysics and philosophy of science literature. There, 'power' may refer to a disposition or potentiality that need not be actualized.[5]

In what follows, I'll primarily focus on natures (and the powers that make them up), rather than unactualized capacities. This is not to deny that, for any plausible necessitation reading of Kantian laws, unactualized capacities will play a crucial role. Capacities will be invoked to ground truths about possibilities. The main question I want to address here, however, is whether the early Kant takes the *actual* laws—and more broadly, general truths about nature in senses (1)—to be reducible to particular natures and powers. If actual laws and other general truths about nature are shown to be irreducible to powers, then necessitation readings are already in trouble, however things stand with counterfactuals and unactualized capacities.

Kant draws a second, independent distinction between the activity of a cause and the passivity of an effect.[6] For Kant, a thing's capacities can be actualized even when the thing does not become causally active. Kant considers the example of a student's capacity to be taught (*LM-H* 28:27). This capacity gets actualized when, for example, a gifted teacher acts on the student;

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[4] I follow much of the literature by translating *vis* or *Kraft* as 'power.' As Dyck (2008, 154 n.8) notes, however, 'force' better captures the active and actual (rather than merely potential or dispositional) character of *Kräfte*, as well as their role in empirical science. As for *Vermögen*, the translation 'capacity' preserves its merely potential connotations (Longuenesse 1998, 7–8; Smit 2009, 240; McLear 2020, 37).

[5] Ellis (2001, 49), for example, treats 'power' and 'capacity' as synonymous. On the actual rather than potential or dispositional status of powers for many early modern thinkers, see Pasnau (2011, 519–546).

[6] See also *LM-H* 28:846 and 28:897. Some of Kant's predecessors used the term '*capacitas*' to denote a passive and receptive potentiality, and '*facultas*' for active potentialities (Baumgarten 2013, §216). Kant was presumably aware of this distinction, but his German term '*Vermögen*' tends to blur it. Note too that for eighteenth-century thinkers such as Baumgarten, *facultas* typically refers to abilities that are innate rather than acquired (an example of the latter is the capacity to play the flute; see Aristotle's *Metaphysics* Θ.5).

causally speaking, the student "suffers" (*leidet*) or is receptive (*LM-H* 28:51; 28:27). In what follows, to simplify things, I'll primarily focus on powers that *act* by determining or grounding effects in other things (*LM-H* 28:44; *LM-V* 28:434). In this case, activity and actualization may coincide. For when one thing causally acts on another, it can thereby provide "sufficient reason for the actuality" of an effect, such as a change (*LM-H* 28:26). To return to Kant's example, the sufficient reason for the *actualization* of a student's capacity for learning might be the *action* of a suitably talented teacher.

In fact, Kant takes the material world to involve widespread causal *interaction* (*LM-H* 28:51). Insofar as it interacts, something can be both causally active and causally passive. Two balanced dominoes that lean on each other, for example, are in mutual causal interaction.[7] Invoking Newton, Kant holds that all "things in the world" are in mutual causal interaction; by contrast, God acts on things in the world asymmetrically, without being acted upon in return (*LM-H* 28:27–30; 28:35; 28:848). Kant's emphasis on real interaction is among the most noteworthy features of his early metaphysics; I discuss it further below.

Let us turn, finally, to *laws* (*Gesetze*).[8] Broadly, texts from across Kant's career characterize laws as general and necessary conditions (*PM* 1:485; *FS* 2:60; *OPA* 2:96; *CPR* A113). This is compatible with distinctions between laws that hold with *strict* generality and necessity and various weaker senses of laws. For the early Kant, absolutely universal laws would pertain to all created beings whatsoever, including rational agents. Absolute necessity is something like logical necessity, "the opposite" of which "cannot be thought at all" (*NE* 1:394; OPA 2:77). At least in his pre-Critical works, Kant seems to hold that this strictest form of necessity is cognizable only a priori, in the sense that its negation is contradictory or unthinkable on the basis of "an immediate and self-evident inner consciousness" ('PE' 2:286; *NE* 1:394). This kind of cognition is fairly unproblematic for logical laws such as the law of contradiction (*FS* 2:60).

Most natural laws, by contrast, will not be cognizable entirely a priori. The exception is a handful of so-called *metaphysical* laws. The epistemological status of metaphysical laws is not always clear, but in any case they will not be my main focus here; necessitation readings typically do not focus on metaphysical laws or their reduction. Nevertheless, it will be helpful to consider how metaphysical laws fit into a broader taxonomy of pre-Critical Kantian laws. The following plausible taxonomy captures some major distinctions between laws in this period:

(i) *metaphysical* laws of nature are universal, absolutely necessary, and cognized a priori (e.g., the law of continuity of change, or the law of cause and effect);[9]

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[7] This is also an example of what Kant calls *dead force*, or *vis mortua*, which grounds an actual change but is not manifest in observable motion (*LF* 1:14–30; *LM-V* 28:424). In Cartwright's (2009, 150–53) terminology, dead force involves the exercise of a capacity without its manifestation in motion. Kant's conception of *vis mortua* raises the question, which is beyond the scope of this paper, whether the early Kant allows that true and apparent motions can be distinguished by measuring *forces*—as in Newton's rotating-spheres thought experiment.

[8] For overviews of the extensive literature on the historical origins of the category of 'laws of nature' see Ruby (1995) and Ott (2009).

[9] On continuity see *NE* 1:399, *LM-H* 28:41, and *LM-L*$_1$ 28:203; on cause and effect see *LM-H* 28:55 and *OPA* 2:105. The notion of a metaphysical law of continuity is influenced by Leibniz: see *LM-H* 28:41–2 and for discussion

(ii) *teleological* laws of nature are universal and cognized a priori, but not absolutely necessary because they depend on divine wisdom (e.g., Maupertuis's least action principle, *OPA* 2:98–9);
(iii) basic *dynamical* laws pertain to all matter essentially (i.e., not to minds), are in some not entirely strict sense necessary, and are not cognized merely a priori (e.g., the laws of attraction and repulsion; see *PM* 1:482; *LM-H* 28:43; *OPA* 2:139);
(iv) laws of *motion* pertain to all matter insofar as it is in motion, and likewise have some non-strict necessary status and are not cognized merely a priori.[10]

A first point to keep in mind about this taxonomy is that, even when necessity is less than absolute or strictly logical, it is not trivial. In the case of teleological laws, for example, it is morally necessary that God create a good world. So God could not have chosen to create a world that lacks all teleological "harmony" (*OPA* 2:91). Nevertheless, we can *conceive* of logically possible worlds that were not chosen by any agent, came about by fate or chance instead of a "moral ground," and lack all teleological order (*OPA* 2:101).

In turn, although the necessity of empirical laws is not unconditional, such laws are necessary for nearly all practical purposes. Exceptions to empirical laws, Kant suggests, "cannot occur in reality" (short of miraculous intervention), even though we can at least conceive of worlds where different empirical laws obtain (*NE* 1:399). This point has important practical consequences: Kant argues that the mere logical possibility of doing otherwise cannot establish our freedom if alternative possibilities are ruled out by the actual empirical laws of nature (*NE* 1:399).

Relatedly, even laws in sense (iv) govern powers of matter *in general*. So they are broader than regularity statements that range over manifest natural kinds, such as *Salt is soluble in water*. As I discuss further in section 4, some influential defenders of necessitation readings assume that such statements about manifest kinds are paradigmatic, irreducible laws of nature (Kreines 2008, 532; Messina 2017, 136–37). In turn, if such statements are one's paradigm of natural law, a necessitation reading may look more plausible. That is, if we begin by assuming that *Salt is soluble in water* is a genuine law, and then look for metaphysical grounds of this fact, then an understandable place to look will be the *natures* or *essences* of salt and water. But it is not clear that the early Kant shares this assumption. Paradigmatic laws, for Kant, look more like the least action principle—a principle that makes little or no reference to the features of any natural kind. This suggests that natures or essences look less intuitively promising as grounds of laws.

Glezer (2017, 73–84). Kant's general conception of metaphysical law ('PE' 2:295–96) is in turn indebted to Crusius (1745, §§13–15; 1747, §260).

[10] Section 2 of Kant's *Only Possible Argument* clearly takes the properties of "things known to us through experience" to include "the laws of motion" (*OPA* 2:92; 2:96). This is important for the argumentative structure of the *Only Possible Argument*: the laws of motion figure in a regressive or a posteriori teleological argument for the existence of a creator, which Kant takes pains to distinguish from the a priori ontological argument developed in Section 1 of the same work. While this may not be entirely decisive evidence, necessitation readers typically agree that the laws of motion are not fully a priori (just because the nature and powers of matter are not known a priori).

Finally, Kant often presents laws in at least senses (ii)–(iv) as "established" by the prescriptive acts of a divine lawgiver (*UNH* 1:226; *NE* 1:406; 1:413; "Optimism" 2:32). Just what Kant means by these claims is controversial.[11] It is worth stressing that such prescriptive acts need not be unconstrained or lawless. At this stage, Kant holds that the "realities" (*realia*) of possible things—which constitute their essences—are eternally grounded in God qua absolutely necessary being (*UNH* 1:263; *NE* 1:395). While Kant does not explain the underlying metaphysics here in much detail, the implication is that truths about possible *realia* are absolutely necessary, therefore not up to God's will. But God voluntarily chooses to create the actual world. This means the natural world and its laws are not fundamental, brute facts—even if our ability to explain nature in terms of divine choices is in practice fairly limited.

2. Laws in the 1750s: Material Phenomena and their Grounds

In this section, I begin to flesh out Kant's early account of laws by considering some features of his conception of law that are already in place by the mid-1750s. I will suggest that Kant already has the outlines of a distinctive, realist account of laws at this point, on which they cannot be reduced to powers or natures. Many features of this account are still in place in the 1763 *Only Possible Argument*; I'll argue below that this later work can be seen as adding to Kant's earlier account of laws, rather than drastically revising it.

2.1 Kant's Multilevel Metaphysics

In the 1750s, Kant already takes some aspects of the created world to be more fundamental than others. It will be worth bearing this in mind as we look at his developing conception of natural law. Kant distinguishes the level of material bodies from more basic, substantial constituents of the created world. For example, extended bodies are an effect of monadic forces and are not themselves substances (*PM* 1:477–9; *LM-L$_1$* 28:209). Instead, bodies and their properties such as motion are *phenomena* or appearances (*LF* 1:141; *NE* 1:408).

Here Kant seems to be influenced by Wolff and Baumgarten, for whom phenomena are accidents that are grounded in more basic simple substances.[12] Ordinary objects such as horses and tables are phenomena—accidents that only "seem…to subsist *per se*," as Baumgarten puts it (2013, §193). For Kant too, causal powers are not, in metaphysical strictness, to be attributed to phenomena (*NE* 1:408). Baumgarten allowed phenomena to be treated as substances, to which causal powers can be "attributed," for practical purposes (2013, §233; §193; §197; §201). Similarly, Kant speaks of "phenomenal substances" (LM-*L$_1$* 28:209), and of phenomena that are actual or objective ("*wirklich*," *LM-H* 28:7). The latter are distinguished from so-called "mere

[11] Langton (1998, 118–9) reads Kant as saying that the intrinsic essences of substances in no way limit the laws God could prescribe. Insole (2011) defends a contrasting reading, on which the intrinsic essences of the substances God chooses to create entail a unique set of laws. It is plausible that Kant holds a view somewhere between these two extremes (Allais 2006).

[12] See for example Wolff (1720, §59, §76, §593; 1737; §§164–65; 2001, 336). In the historical background is Leibniz's complex account of phenomena, which is beyond the scope of this paper. For differing accounts of how Leibniz takes material phenomena to be based in monads, see Adams (1994, 217–61) and Rutherford (2008). Newton's denial, in the *Principia*'s General Scholium, of *knowledge of substances* may also be relevant.

appearances" ("*bloß Erscheinungen*"), which are only "in" a single subject and associated with Berkeley's idealism (*LM-H* 28:42).

Nevertheless, for Kant in this period, fundamental causal powers are only wielded by simple substances that are not directly observable. In sum, the metaphysics the early Kant takes up from his rationalist predecessors differs markedly from typical Scholastic or Aristotelian realism, on which many objects of ordinary experience are genuine substances, endowed with efficacious causal powers corresponding to the manifest natural kind they fall under.[13]

2.2 Laws and Material Phenomena

In the 1755 *Universal Natural History*, Kant repeatedly stresses that laws explain material phenomena:

> Matter, which is the original material [*Urstoff*] of all things, is…bound by certain laws, and if it is left freely to those laws, it must necessarily bring forth beautiful combinations. (*UNH* 1:228)

So at least all material phenomena are composed of a single natural kind, *matter*, on the basis of which an account of the world in general is in principle possible (*UNH* 1:229). Kant does not mention the status of souls or minds here, but it is clear from other texts that he is not a materialist.

The composition or combination of matter is in turn "bound by" laws. That is, laws explain why the parts of matter compose the phenomena they do, rather than being combined in some other way. This conception of the material world underlies Kant's project in the *Universal Natural History*, which seeks to explain the formation and general features of the solar system merely on the basis of broadly Newtonian laws of motion or mechanics.[14] So when Kant refers to the "essential constitutions" or "natures" of objects of ordinary experience such as clouds, he is speaking loosely, in the sense that he does not take clouds to be members of additional fundamental natural kinds, over and above matter, with fundamentally new causal powers. A cloud, for example, is in ontological strictness nothing more than a law-governed arrangement of matter (*UNH* 1:225; "Winds" 1:489–503; *OPA* 2:102). Essential constitutions are nonetheless mind-independent features of the world: for example, the way in which clouds are composed out of matter in accordance with laws of nature.

We'll see in section 3 that by the early 1760s, Kant is less committed to a single basic natural kind. Nevertheless, it is important to see that Kant begins with this commitment, adding further natural kinds only when there are compelling empirical grounds for doing so. Even if he allows for more than one basic natural kind in the 1760s, he continues to take laws to play a critical role in explaining how the objects we experience are built up out of these kinds. He continues to stress throughout the '60s that "natural events are explained" by being shown to fall

[13] The link between causal powers and natural kind membership was particularly explicit in medieval accounts of causally active substantial form (Pasnau 2011, 549–73).

[14] While Kant presents himself as part of a Newtonian tradition, his laws of motion differ significantly from Newton's: see Watkins (2019, 89–117). General discussions of Kant's project in the *Universal Natural History* include Adickes (1924, II:206ff.), Laberge (1973), and Schönfeld (2000, 96–127).

under laws of nature ('PE' 2:286). He adds the Newtonian point that lawlike explanation of material phenomena can succeed even when the causal grounds of the laws themselves are "unknown" ('NDMR' 2:20; *LM-H* 28:886).

Some Newtonian philosophers, such as Maupertuis, would be willing to stop here. A Newtonian with naturalistic leanings could claim that once we have empirical explanations of phenomena in terms of the laws of basic natural kinds, there is nothing more about phenomena to explain. One could even take the laws of matter as a guide to the metaphysics of things in general—as Euler arguably did around 1748.[15]

Two works Kant wrote in the mid–1750s, however, show that he is disinclined to stop with empirical laws. At the opening of the *Physical Monadology* (1756), he claims it is possible to attain a "deeper understanding of…first causes" than is given by empirical laws of "the phenomena of nature" (*PM* 1:475). The *Physical Monadology* inaugurates a long-lasting inquiry into the fundamental attractive and repulsive forces of matter, which Kant here attributes to physical monads. Matter, according to Kant, "consists" of these monads or non-extended simple parts (*PM* 1:477).

So while laws have explanatory priority at the phenomenal level, it might look as if natures and powers do the main explanatory work when it comes to fundamental physical monads. Actually, this is not clear. Michael Friedman (1992, 195n.45) has noted that despite its title, the *Monadology*'s metaphysical project is limited. The work presupposes the reliability of broadly Wolffian metaphysics and of mathematical physics, and then seeks to show how these disciplines can be made mutually consistent (*PM* 1:475). Its stated goal is just to prove the "existence" of two fundamental forces, and *not* "to inquire into the laws governing the two forces" (*PM* 1:484). How laws and forces relate, at the fundamental level, is not laid out in any detail.[16]

In fact, the little Kant does say about physical monads implies that laws governing fundamental forces are at least conceptually distinct from the forces themselves (*PM* 1:484). Knowledge of the number and basic nature of fundamental forces does not entail determinate mathematical knowledge of the laws of those forces. While it is debatable whether Kant takes any metaphysical distinction between fundamental forces and laws follows from these claims, the *Physical Monadology* at least does not clearly assert that natures or powers have priority over laws, even at the level of monads.

Kant develops his metaphysical ideas in greater detail in the 1755 *New Elucidation*. This work claims to shed light on the "first principles of our cognition," which cannot be identified with the laws or principles of material phenomena (*NE* 1:387). From these first principles, Kant in turn wants to derive robust metaphysical claims. But even this foray into metaphysics invokes

[15] Laywine (1993, 31) helpfully discusses Euler's "Reflections on Space and Time."

[16] Friedman (1992, 25–27) suggests that this is not an accidental omission. A circularity problem stands in the way of any more determinate account of how physical monads could be governed by physical laws that refer to spatiotemporal properties (such as distance or speed): space and time are themselves, for Kant at this stage, grounded in the interactions of physical monads (*PM* 1:482–83; *NE* 1:415; Pollok 2002, 70–7). I leave this problem aside here.

not so much powers and natures as *laws* and principles—or so I argue in section 2.3. This basic commitment remains stable in the following years, even if Kant fills in more details about precise status and character of these laws later on.

2.3 Metaphysical Grounds of Material Phenomena

The ambitious aims of the *New Elucidation* include clarifying and proving the principle of sufficient reason and deriving from it "two new principles" of metaphysics (*NE* 1:387). Several commentators have noted that the precise meaning and justification of the principle of sufficient reason in this work are not as clear as one might wish (Laywine 1993, 33; Schönfeld 2000, 133–34; Longuenesse 2005, 121–25). But it is relatively straightforward to discern the metaphysical cosmology Kant claims to derive from the principle of sufficient reason. First, he advances a *Principle of Succession*:

> No change can happen to substances except in so far as they are connected with other substances; their reciprocal dependency on each other determines their reciprocal change of state. Hence, a simple substance, which is free from every external connection and which is thus abandoned to itself and left in isolation, is completely immutable in itself. (*NE* 1:409–10)

In other words, if any created substance whatsoever were causally isolated, its causal capacities would not be activated and it would not change in any way, either in its extrinsic relations or in its internal states. Note that a necessary condition for the activation of a capacity is not yet a sufficient condition for a substance's acting via that capacity in any particular case. This leaves room for substances that *act* asymmetrically rather than interact.[17]

Kant takes the Principle of Succession to rule out Leibnizian pre-established harmony, on the assumption that Leibnizians are committed to some kind of internal change in substances. Kant insists instead that there is a "real reciprocal action between substances…by means of truly efficient causes"—and that this reciprocal action is governed by a "law" (*NE* 1:415).

Kant also claims that the intrinsic properties of finite substances themselves do not suffice to determine any general causal order, which also requires laws. This point is directed, not so much against pre-established harmony as against so-called *original* influence theories. According to original influence theories, Kant writes, "the principle of substances, considered as existing in isolation," is sufficient to ground their causal relations in the absence of further laws (*NE* 1:416). Kant agrees with these theories that created substances causally interact. He denies, however that the powers of substances, even if they are aggregated together, suffice to fully ground this influence. Further principles must play a role as well. This is evidence that, contra necessitation readings, Kant does not merely appeal to the powers of substances to explain the created world. Below, I'll explain further why Kant should be read as taking the relevant principles to be laws, rather than reducible to divine acts.

[17] We've seen that this is how Kant takes God to relate to the world. By the mid-1760s, Kant tries to use a similar move to explain how the volitions of finite agents can be free acts that are "absolutely contingent" (*Refl. 3717* 17:260; Hogan 2009, 370–72).

To support his case against original influence theories, Kant invokes another alleged consequence of the principle of sufficient reason: the *Principle of Coexistence*. According to this principle, finite substances do not causally interact just in virtue of being co-instantiated; interaction requires a further ground. Or as Kant puts it, "finite substances do not, in virtue of their existence alone, stand in a relationship with each other," but instead require a "common principle of their existence" (*NE* 1:412–13). This lawlike connection of substances is in turn grounded in "the divine understanding" (1:413). God conceives and creates substances as in reciprocal causal relations, rather than as "in isolation" (1:414). Kant goes on to enlist the Principle of Coexistence in a version of the cosmological argument.[18]

Here, as Gerd Buchdahl puts it, it is plausible that "God provides the ground or rationale for the *possibility* of interaction" (1971, 41). But the "common principle" that immediately grounds interaction is not just identical with God's actions. Kant carefully distinguishes his account from Malebranchean occasionalism, in that the "law" of "real reciprocal action between substances" is, once created, metaphysically distinct from God's acts, as well as from the mere non-relational properties of substances (*NE* 1:415).

Kant supports this non-occasionalist position through a pair of cosmological distinctions. In the *Universal Natural History*, Kant already claimed that the world's observed synchronic form or 'build' (*Weltgebäude*) can be distinguished from its lawlike, rational structure (*Weltbau*) (*UNH* 1:222; Buchdahl 1988, 480–90; Clavier 1997, 18–19). Baumgarten also considers a diachronic distinction between the mere course or succession of actual happenings and the lawful order of nature; Kant takes this up explicitly in the early 1760s (*OPA* 2:109; Baumgarten 2013, §§471–72). In either case, the laws do not supervene on the actual distribution of events in space and time, or on the underlying distribution of powers and natures. It is unclear, Kant points out, how general and unchanging (let alone necessary) properties could be found out by describing the actual course of nature, even if notions of causal power are invoked. (Here Kant may be influenced by Hume, whose work he knew of by 1759.) All the same, the structure or order *of nature* cannot be identified with divine actions, either.

Kant's defense of these claims is not always persuasive. Few readers would agree, for example, that he disproves pre-established harmony via an "infallible chain of grounds" (*NE* 1:411). And Kant hardly argues that God must ground the laws—against, for example, a theory on which laws are just brute features of the natural world.[19] But despite these justificatory weakness, it is striking that Kant repeats criticisms of original influence theories in metaphysics lectures throughout the 1760s and 70s—and into the Critical period. A consistent theme is that original influence theories leave causal interactions as brute or "blind" facts, which can only be

[18] Adickes (1924, II:216–17) argues for the influence here of Maupertuis (1744, 1756). By 1763, Kant recognized that this cosmological argument fails: a mere architect or demiurge would satisfy the Principle of Coexistence (*OPA* 2:160).

[19] Laywine (1993, 32–33) discusses how Kant apparently begs the question against pre-established harmony theories. She also notes the weakness of case against occasionalism in the *New Elucidation*; occasionalism is *prima facie* compatible with Kant's principles of Succession and Coexistence (40). Ameriks (2003, 127–8) points out that Kant's criticisms of original influence theories do not show that a "transcendent being" must be involved in addition to the laws of nature.

seen as grounded in occult powers of the interacting substances (*LM-H* 28:887–88; *LM-L$_1$* 28:213). Occult powers are not empirically observable, but they are also brute and not further explicable. His preferred alternative remains what he calls a *derivative influence* theory, appealing to universal laws of nature.[20] At least some laws, unlike occult powers, are empirically observable. As noted above, the laws themselves are not primitive or brute because they are at least metaphysically grounded in God's will and understanding (*LM-H* 28:52).

Relatedly, throughout his pre-Critical career, Kant stresses that the lawlike nature of matter distinguishes his cosmology from Epicurean materialism. He admits that at first glance, his position seems to have much in common with Epicureanism. Kant, like Lucretius, seeks to explain a wide range of phenomena in terms of a single natural kind endowed with two basic forces (Lucretius 1992, I.265ff.). But Kant underscore that where Epicureans appeal to chance collisions that lack any lawlike "explanation," he instead makes use of "a recognized and established law of nature" (*OPA* 2:148-9; *UNH* 1:227; *LM-L$_1$* 28:200). We need not agree with Kant's reading of Epicureanism to see that he takes laws, rather than mere natures, to make the difference in explaining material phenomena. Moreover, laws of nature are not just a heuristic way of sorting through complex phenomena. They are the cornerstone of a fundamentally non-Epicurean metaphysics in which the "dependency of nature upon God" is manifest (*OPA* 2:125; *UNH* 1:334).

In this section, I've provided some evidence that Kant's basic picture of the metaphysical independence and explanatory importance of laws is established by 1755, and that key aspects of it remain in place thereafter. But there are also important developments in Kant's account of laws, especially in the 1763 *Only Possible Argument*, which I turn to in the following section.

3. Lawful Unity in the 1760s: The Least Action Principle

In the early 1760s, we find Kant less optimistic about the explicability of all phenomena in terms of matter and universal Newtonian laws of motion. His response is to draw attention to what he takes to be a still more general law: the least action principle. While Kant interprets this principle teleologically, it is emphatically a principle of *nature* and distinct from God's actions. In the *Only Possible Argument*, Kant seems to accept that the least action principle entails various laws of motion, and is not entailed by them. So the least action principle is an explanatory unifier of these natural laws. Yet Kant also seems to suggest that the least action principle is not just a useful theoretical generalization but expresses global *metaphysical* facts about nature.

3.1 Real and Explanatory Grounds

It will be worth digressing a moment to consider an important distinction Kant draws between kinds of grounding. In general, a *Grund* or *ratio* is just "that which determines a subject

[20] Compare *LM-H* 28:52–53, *LM-L$_1$* 28:214, and *LM-D* 28:666–67, which respectively date from the early 1760s, 1770s, and 1780s. On the idea that the universality of laws must be explained in terms of an intelligent cause, see further *OPA* 2:125, 2:151, *LRT* 28:1109 (early 1780s), and *Reflexion 6038* 18:430 (late 1780s).

in respect of any of its predicates" (*NE* 1:391). But Kant repeatedly warns of confusion if we do not observe various distinctions among kinds of ground. Here I focus on the difference between real and explanatory grounds (*NM* 2:203, *LM-H* 28:24).[21] The aim is primarily clarificatory; I don't take my main argument to rest on this reading of Kant's taxonomy of grounds.

'Real' grounds are dependence relations such as cause–effect and substance–accident. Today we might call these *metaphysical* dependence or grounding relations. Kant never seems to doubt that the world is connected by real grounding relations, even if the "manner…how" these connections obtain is unknown to us (*NM* 2:202).

Kant also discusses 'explanatory' grounds (*LM-L$_1$* 28:200; 28:210). An explanation, in the first instance, is a correct pattern of reasoning, made up of propositions or judgments: for example, a deductively valid syllogism. Reasoning can be correct in this sense even if it is not sound, or as Kant puts it, "true."[22] There is clearly a sense in which false premises explain a conclusion they entail (if the conclusion does not also entail the premises). But Kant suggests in logic lectures from the early 1770s that if an explanation is fairly accurate, it will have objective correlates in the actual world, such as real grounding relations. (*LL* 24:51). Hence Kant can acknowledge an extended sense in which real grounds can be explanatory, namely insofar as they are expressed in the content of true explanations.

These kinds of grounding relation may come apart. For example, on one kind of necessitation reading, natures or essences might be shown to really ground the laws of nature, even if they cannot be known in any determinate way (and so cannot be used as explanatory grounds). Engelhard (2018) defends something like this reading for Kant's Critical account of empirical laws. We can find analogous proposals in the recent literature. Ellis (2001, 248–49), for example, argues that laws have some sort of irreducible epistemic or explanatory priority, but that metaphysically speaking, essences or natures come first.

3.2 Kant on the Least Action Principle

Returning to developments in the *Only Possible Argument*: Kant now acknowledges that even general physical principles have certain limitations. For example, elastic and rigid bodies follow different "laws" of impact (*OPA* 2:134). And, we learn from optics, light follows different rules from those governing ponderable matter (*OPA* 2:99). Organisms present a special explanatory challenge that Kant returns to in the third *Critique*. Compared to celestial bodies, for example, the "inner motion" of even a caterpillar is too complex for our "weak" cognitive faculties to represent in a "mathematically certain" way (*OPA* 2:138). Note, however, that Kant's stance on celestial mechanics—which explains phenomena in terms of a "fundamental force" of

[21] For Kant's conception of *logical* grounds, which I leave aside here, see Stang (2016, 85), who also defends an alternative reading of Kantian explanatory grounds. Kant also discusses Crusian grounds of cognition (*rationes cognoscendi*) (*NE* 1:392; *LM-H* 28:37; *LM-Mr* 29:748; Crusius 1745, §34). Their relationship to explanatory grounds is beyond the scope of this paper.

[22] On explanations as 'true' or 'false' see e.g. *UNH* 2:254. By 1755, Kant had adopted an account of explanations as correct patterns of reasoning rather than as real grounds—even if his most detailed *theory of* explanatory grounds appears later, e.g. in the 1770s *L$_1$* lectures.

"matter itself"—is largely unchanged from the *Universal Natural History* (*OPA* 2:138). Celestial mechanics, and more speculative questions concerning the origins of the solar system, require only a single fundamental kind (matter) and maximally general laws (*OPA* 2:137–51).

The explanatory status of organisms, by contrast, is not immediately clear from the text. Kant's discussion of the caterpillar might suggest that a special kind of explanation is needed—perhaps even irreducibly different natural laws, or special divine institutions (Friedman 1992, 12–13). Kant suggests that organisms exemplify "contingent" unity; on the same page, however, he raises the possibility that they are no more than "the necessary effects of a single ground" (*OPA* 2:107; 2:96; 2:126; 2:136–8).

These claims can be reconciled if we first recall that the relevant section of the *Only Possible Argument* is focused on a posteriori teleological inferences (*OPA* 2:93; 2:96). Here Kant is largely concerned with *conditional* modal questions about what follows necessarily *if* God chooses to create a world with certain features (*OPA* 2:100; 2:106).[23] In this conditional sense, a fact could be contingent relative to some features of the actual world, but follow necessarily from others.

This is in fact how Kant fits caterpillars and other organized beings into nature in general. Organisms are contingent relative to "completely comprehensible mechanical laws"—where 'mechanical' is to be taken in a broad sense that includes Kant's (dynamical) laws of physics and the properties of matter associated with them (*OPA* 2:138; 2:96; 2:110; 2:114). But we can still assume that organisms and other apparently teleological features of the world are grounded in some even more "universal laws" (*OPA* 2:136; 2:115).

What are these universal laws, and how do they relate to the laws of matter? This brings us to the main focus of this section: the new role for the least action principle.[24] In the *Only Possible Argument*, the least action principle—that "the greatest possible economy of action is always observed"—is presented as having been "proved" by Maupertuis (*OPA* 2:98). Maupertuis had in fact defined the quantity of action for a single body as the product of velocity and path length, but Kant sticks to a qualitative characterization of the principle, which he calls the "necessary…law of parsimony in nature" (*OPA* 2:134). He goes on to assert that this law is the "one dominant rule" or "single supreme principle" under which both laws of motion and the nature of matter can be "subsume[d]" (*OPA* 2:99; 2:96).

The role of the least action principle is both explanatory and metaphysical. It is, in the first place, a higher-order explanatory unifier. That is, the principle does not just unify particulars: the *laws* of matter themselves are "subsume[d]" or "subordinated" under it (*OPA* 2:98–9, 'Earthquake' 1:460). It purportedly has broad physical significance, providing explanatory grounds for the laws of statics and dynamics, of elastic and inelastic bodies, and of

[23] Charrak (2006) documents an increased focus on such conditional modal questions in the late 1750s, especially in France. He cites, among others, Maupertuis (1756, 402–3), d'Alembert (1758, xxvi–xxvii), and the majority of anonymous respondents to the Berlin Academy's 1756 prize-essay question. Kant discusses both Maupertuis and this prize essay competition in the *Only Possible Argument*.

[24] See Part II of Maupertuis's *Essai de Cosmologie*, and especially Maupertuis (1744, 42–3), where he claims to deduce the laws of motion from the least action principle.

optical refraction and repulsion (*OPA* 2:89–99; Maupertuis 1744, 42). In virtue of grounding these laws, the least action principle can contribute to the explanation of a wide range of regular phenomena, ranging from wear in mining gears to the courses of rivers (*OPA* 2:130).

So at this stage in his career, Kant no longer regards Newtonian laws of motion as the sole basis for explaining the material world. Instead, Maupertuis's innovation is needed to bring "unity into the infinite manifold of the universe," including its multiplicity of lower-order laws (*OPA* 2:99). The least action principle is supposed to provide a simple, cohesive explanation of a wide range of laws and phenomena. It can do so even if we do not know all the underlying details of how the least action principle explains how particular bodies act. In fact, Kant does not show how the least action principle is the explanatory ground of physical laws, in the sense that their content could be *derived* from it. And while the principle is presented teleologically, Kant does not seem to think we can determinately explain it in terms of God's motives. This is because "the world's being naturally connected" by laws is not "the good" in itself; natural lawlikeness is a means to God's "further purposes" (*OPA* 2:109; 2:110n.). We may be able to understand *that* there are such purposes, but remain ignorant of what, determinately, these purposes are—or how they play out in the created order.

One could cautiously regard the least action principle as just a convenient way to summarize natural regularities, or as unifying subsidiary laws by expressing a widely applicable pattern of reasoning. But Kant goes further. He takes there to be a *metaphysical* "principle" in nature, which makes statements of the least action principle true (*OPA* 2:99).[25] Nature, not just our theories, manifests order and perfection. In particular, Kant asserts that the very possibility of matter is not independent or "given…for itself"—such that it could be instantiated whether or not teleological laws hold (*OPA* 2:99; 2:131). Rather, for a possible world to instantiate matter, a least action principle must hold in that world.

Kant thinks this is evidence that nature is grounded in an intelligent will, rather than chance or blind necessity (*OPA* 2:89). Kant repeatedly stresses, however, that this will does not directly *arrange* particulars in nature, which instead "issue with necessary unity from the most essential rules of nature"—that is, natural laws (*OPA* 2:118).

3.3 Implications

We've seen that Kant's ambitious use of the least action principle has justificatory shortcomings. Let us step back from these problems and consider what led him to take nature to be governed by a metaphysical principle of economy. On the one hand, we've seen that Kant now allows that phenomena both inside and outside physics are not readily explicable in terms of the nature and laws of mere matter. On the other hand, Kant wishes to avoid the alternatives of Wolffian supernatural teleology, full-scale occasionalism, *and* the local miraculous adjustments he associates with Newton (*OPA* 2:110n.). Kant takes all of these systems to try to explain

[25] Kant apparently assumes Maupertuis *proved* the action principle to be a *universal* law. Maupertuis's alleged proofs in fact extrapolate from empirical laws, such as Fermat's principle of least time in optics. On Maupertuis and least action principles see Jourdain (1913) and Pulte (1989).

phenomena by special divine institutions without any known law.[26] Kant rejects this as a supernaturalism that undermines "all scientific research into…causal factors" (*OPA* 2:128).

But if the range of natural laws is expanded to include a least action principle, so too is the range of what can be explained in terms of the laws of nature. Kant interprets the least action principle as one that could only be grounded in a creative will and understanding (*OPA* 2:88). So God is the remote cause ("*causa ulterior*") of natural events in accordance with the action principle (*LM-H* 28:888). Once instituted, however, the least action principle holds as a "universal formula" that does not admit of arbitrary exceptions: it is a genuine law of nature (*OPA* 2:99).

There is another plausible motivation for Kant's adding a new law to his cosmology. This is the need for a sufficiently general principle that could unify the world into a single, causally interacting "totality" (*OPA* 2:99). As Peter Yong (2014, 38–44) has discussed, a key assumption in the *Only Possible Argument* is that a mere sum or aggregate does not constitute a proper totality (*OPA* 2:79–83). Adding up all the "particular natures" of created substances will at most yield a "sum [*Summe*]" of these natures, rather than the "entirety of nature [*die gesammte Natur*]"; the latter requires "the unification" of these natures above and beyond their mere aggregation (*LM-H* 28:888; *LM-L$_1$* 28:216; Laywine 2006, 110). So the least action principle is not true of the actual world just in virtue of all the essences of created beings and their causal powers. Rather, a certain way of really relating these beings is required. Such real relations are not things or substances but still have can have irreducible, extramental reality.

It would be miraculous, Kant asserts, if the individual essences of "natural things" conspired to bring about the effects he attributes to the least action principle; such an outcome would be "impossible" without "a large number of supernatural interventions" (*OPA* 2:112). He continues: "there is an admirable community to be found among the essences of all created things. This community is such that the natures of things are not alien to each other but are united in a complex harmony" (*OPA* 2:131). Note, once again, that the connection of the world by laws is a metaphysical fact, not just a metaphor. Particular "things of the world," miracles aside, *depend* on God "through the mediation of" the lawlike order of nature (*OPA* 2:103; 2:151; *LM-L$_1$* 28:219). So, overall, Kant's introduction of the least action principle provides further evidence that he does not regard laws as reducible to the properties and powers of particular substances.

To the extent that necessitation readings take laws to be reducible to the powers of particular substances, they will be unable to accommodate this aspect of Kant's pre-Critical position. The early Kant was evidently aware of Leibnizian approaches to the metaphysics of created substances, on which laws are "inherent" in particular substances (Leibniz 1880, IV:504–16). But *pace* Messina (2017, 140–41), Kant decisively breaks with Leibniz on this point. He holds, as we've seen, that without a miracle it would be *impossible* (not just improbable) for

[26] On occasionalism as Kant understands it, God's will is arbitrarily "determined" by particular worldly "circumstances" (*NE* 1:415; *LM-H* 28:887–8; *OPA* 2:110, 2:120–4; 'ID' 2:409). For discussion see Clavier (1997), Schönfeld (2000, 96–106), Afeissa (2009, 150), and Massimi (2014).

mere particular powers to add up to general laws governing the totality of nature. By contrast, Kant's 1760s realism about teleological laws fits nicely with the metaphysically robust reading of laws of nature that I defend here.

To be sure, necessitation readers are not bound to explain Kant's pre-Critical commitment to teleological laws via the powers of particular substances. But one of the philosophical motivations of necessitation readings is to explain laws of nature in an immanent, naturalistic, and epistemologically modest way. So if necessitation readings of Kant's pre-Critical works appeal to (for example) direct divine intervention to ground teleological laws, they risk losing these philosophical benefits.[27] A direct appeal to God also comes dangerously close to the occasionalism Kant rejects. In the remainder of the paper, I lay out a reading on which a crucial role *is* delegated to the powers of particular substances, but in conjunction with irreducible, properly natural laws.

4. Laws as Grounds of Necessity in the 1760s

In this section, I turn finally to what is arguably the core claim of necessitation readings. This is the idea that natural necessity, for the early Kant, is rooted in particular natures and powers. There is at least some truth to this claim, on my view. A dynamist in physics, Kant stresses how created substances act through the exercise of powers or forces.[28] Laws of nature are not efficient causes that literally attract and repel matter. Nevertheless, natural necessities are not *fully* grounded in particular natures and powers. They are irreducibly grounded in general laws, as well (*OPA* 2:107–8).

For reasons of space, I will focus on metaphysical questions: on which features of reality ground natural necessity, rather than on how we know and explain necessary truths. I do want to make one passing observation about modal epistemology, however. Kant thinks we have determinate and certain knowledge of some natural laws. So if laws do partly ground natural necessity, we have determinate and certain knowledge of grounds of natural necessity. But on many necessitation readings, laws are reducible to the actual powers of substances. If these readings are correct, natural necessity is grounded solely in God and the actual essences of substances. So on these readings, God will play a comparatively greater role in our modal epistemology: only so many modal truths can be grounded in the sum of particular properties of

[27] I don't see many other options for a necessitation reader who wants to avoid either granting teleological laws a robust ontological status (as on my reading), or reducing them to particular powers. One possibility would be to read pre-Critical teleological laws as anticipating the subjective regulative principles of Kant's Critical works. But I've presented strong textual evidence that the early Kant takes teleological laws to be mind-independent. Another option would be to insist that for Kant, *totalities* as well as particulars can have natures. Messina (2017) raises the intriguing possibility that *nature in general* has a nature. But Messina presents this as a reading of Kant's third *Critique*, taking the early Kant to conceive of "empirical natures" as "particular" (142). Nor does Messina contend that such a thin and widely shared nature would ground particular *teleological* laws. I thank an anonymous referee for pressing me on these issues.

[28] Descartes famously regarded the world as made up of causally passive extension. Many of Descartes' early readers assumed he left all the work of putting bodies in motion to God, despite his references to laws of nature as causes in e.g. Chapter 6 of *Le Monde*. Malebranche follows Descartes in taking matter to be causally passive. He explicitly identifies laws of nature with general divine volitions (Malebranche 1992, 195).

actual substances. Or as Kant puts it: absent "universal laws," God's "foreign hand" would be needed to "force a wise plan onto matter devoid of all regularity" (*UNH* 1:223). Kant does not think our knowledge of God's will is nearly as determinate and certain as our knowledge of natural laws. He holds that divine motives are "incomprehensible to us" and cannot be used in place of explanatory grounds in nature (*OPA* 2:112; 2:115).[29] On reductive necessitation readings, then, we have less of a grip on how exactly natural necessity is grounded.

I mention this epistemological point because necessitation readers sometimes argue that "top-down models of laws" are driven to invoke "God as a legislator" (Messina 2017, 137; Massimi 2014, 494–6). By contrast, they claim, models of laws in terms of particular properties have the advantage of minimizing explanatory appeal to God. But at least where the grounds of modal truths are concerned, reducing laws to powers seems to leave all the more work for divine legislation.

Let's now step back a bit to consider what kinds of natural necessity are supposed to be explained by natures or powers on a necessitation reading. At first glance, there seems to be a distinction between global and local necessary facts. To get at the global issue, we can consider what God would need to do in order to actualize a world that follows a certain set of laws of nature. These laws are not logically necessary. But they hold essentially or necessarily of the world God actualizes. Advocates of necessitation readings typically say that to make some laws of nature actual, all God needs to do is to create a world of fundamental entities with certain natures. These natures ground the laws and their necessity.[30] This appears to be a non-causal grounding or determination relation (since as we saw above, intrinsic natures on their own need not be causally active, on Kant's view).

A second question concerns the grounds of local, concerning token causal relations. Kant takes causal relations to have some kind of necessity. Where does this necessity come from? Necessitation readings have a clear answer: this necessity flows from the actual natures of the particular relata. To take Kreines's example, the natures of salt and water entail causal facts about salt's dissolving in water. That the natures of salt and water are thus and so is contingent. But given these actual natures, it follows necessarily that, for instance, "a gold ring would have been water-soluble if it had been made of salt" (Kreines 2008, 532).

I'll now offer alternative readings of Kant's answers to each of these questions. First, consider the global question. Our earlier discussion of the Principle of Coexistence already indicates that necessary connections in the created world do not follow from causal powers of substances alone. If God merely creates fundamental entities and their powers, there will not yet be any determinate laws.

More concretely, consider a modern statement of Newton's law of gravitation:

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[29] For a relevant contemporary discussion of theistic Aristotelian approaches to modality—which resemble necessitation readings when it comes to modal epistemology—see Cameron (2008, 272–76). Some medieval Aristotelians in fact conceded our earthly ignorance of many modal facts, precisely because of our lack of determinate knowledge of God: see Pickavé (2011, 199) on Henry of Ghent.

[30] See Watkins (2005, 335) ("the laws of nature that hold at a given world are a function of the natures that are instantiated in that world"), Watkins (2019, 36), Stang (2016, 235–41), and Messina (2017, 132).

$$F = G\frac{m_1 m_2}{r^2}$$

The fact that matter is endowed with a basic force of attraction is not sufficient to get the law of gravitation as stated. The manner in which these powers operate also depends on the value of *G* and its relationships with values for mass and distance.[31] This is an inverse-square law, but it is logically and metaphysically possible for God to choose to create different law of attraction (*LF* 1:24; *NE* 1:414). In fact, as Kant points out in the *Physical Monadology* and continues to emphasize in the Critical period, there are indefinitely many conceivable laws of basic forces.[32]

An interpretive question I won't fully resolve here is whether Kant thinks it would be correct to call the stuff falling under such non-actual laws *matter*. Some texts do suggest that matter is just whatever is governed by the actual laws of matter (*UNH* 1:250; *OPA* 2:99–100). Now, it is actually not so clear *which* laws Kant is referring to here. The laws in question are supposed to be known fully a priori (*OPA* 2:99). By contrast, the law of gravitation, and laws of matter more generally, are known by "empirical observation" (*OPA* 2:139; *LM-H* 28:887).

But suppose Kant does hold that matter, strictly speaking, is essentially subject to Newton's law of universal gravitation. Even then, Kant assumes that we can conceive of physical stuff—call it *matter** if need be—that would resemble our own matter in possessing attractive and repulsive forces, despite following different laws. The underlying idea is that the general properties of having attractive and repulsive force can be determined by many possible force laws. By abstracting from the laws, we can consider a genus of possible kinds of physical stuff. Anything falling under this genus will have these two kinds of fundamental force. But many possible determinate laws by which these forces operate fall under the genus. Laws thus have explanatory priority over fundamental forces: the actual laws entail that there are some attractive and repulsive forces, but not vice versa.

So for God to create a world with phenomena depending on the law of gravitation, such as the structure of the solar system, more is required than merely creating substances endowed with *some* causal power of attraction. To use Ellis's (2001, 53) terminology, determinate forces such as gravitation are not *primitive* causal powers: the attractive powers of two physical substances do not suffice for gravitation if appropriate laws are not added. By conceiving, prior to creation, the "idea" of a possible world as a "whole," God's intellect grounds (i) the universality and propositional unity of individual laws and (ii) the consequence relations that unify laws of greater and less generality (*OPA* 2:133–34; *Refl. 2835* 16:538 [from the 1760s]).

A question remains: why not assume God creates all the fundamental entities and then immediately grounds the necessary connections between them (such as the relations expressed by the Newtonian formula above)? We might call such connections laws, but metaphysically

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[31] Here I draw on Massimi's (2014, 504) interpretation of this example (despite her endorsement of the metaphysical priority of powers or natures): "Laws govern by necessitating the universal and immutable relations, under which natural powers or real grounds operate (e.g. r^2)." See also Langton (1998, 118).

[32] To be sure, most of these possible laws are incompatible with the world as actually observed. If they obtained, matter would expand or contract indefinitely such that bodies would lack "cohesive structure" or "determinate limit[s]" (*PM* 1:484; *UNH* 1:250; *MFNS* 4:508–11).

speaking they would just be acts of divine legislation. I have already pointed out some passages in which Kant distances himself from this sort of occasionalism, but it is worth considering a passage in the *Only Possible Argument* that revisits this issue in detail. In addition to laying out a distinction between laws of nature and divine acts, the passage helps to clarify the respective roles of laws and powers. Kant writes:

> Something is subsumed under the order of nature if its existence or its alteration is sufficiently grounded in the forces [*Kräften*] of nature. The first requirement for this is [A] that the force [*Kraft*] of nature should be the efficient cause of the thing; the second requirement is [B] that the manner [*Art*] in which the force of nature is directed to the production of this effect should itself be sufficiently grounded in a rule of the natural laws of causality. Such events are also called, quite simply, natural events of the world. On the other hand…something [is] supernatural…either because [C] the immediate efficient cause is external to nature, that is to say, the divine power [*Kraft*] produces it immediately, or…[D] because the manner in which the forces [*Kräfte*] of nature are directed to producing the effect is not itself subject to a rule of nature. (*OPA* 2:103–4)

This passage distinguishes between material and formal criteria for an event's falling under the order of nature, that is, for its being natural rather than supernatural.

The first, *material* condition [A] concerns the causal *source* of the event. For an event to be part of the order of nature, it must causally originate from a created substance that is within nature. Events fail to meet this condition when their causal source is not a created substance, notably in cases of [C] "immediate" production by "the divine power," which Kant calls *materially supernatural*.

The second, *formal* condition [B] for falling under the order of nature is that the "manner" in which the force is the causal source of the event must be sufficiently grounded in natural laws. An event could fail to meet this condition while nevertheless meeting the material condition for falling under the order of nature. Notably, in the case of miracles [D] a created substance could exercise causal powers in a way that is not grounded in any natural law. By definition, however, miracles are an exception to the ordinary workings of nature. Even in this case, at least some laws—namely, special or supernatural rather than *natural* laws—are required to direct the manner in which causal powers produce effects.[33] For in general, any "power of nature" is "governed" by determinate rules or laws ('PE' 2:289, translation modified; *LL* 24:84).

While Kant's conception of supernatural events raises many interpretive questions, a straightforward consequence of this passage is that there is a level of reality that, in Kant's terms, is *both formally and materially natural*. That is, the lawlike order of nature is not just a certain way that God acts. This order is a "result" (*Folge*) of divine action; once created, it acts "of [its]

[33] This can be illustrated by Kant's discussion of *formally supernatural* events. Our "vicious deeds," for example, cannot directly cause an earthquake as punishment, since the earthquake must be determined by laws of nature and these laws must be insensitive to our "conduct" (*OPA* 2:104). What *is* at least conceivable, Kant holds, is that God causes the earthquake via "an immediate divine law" that determines powers or forces in lieu of laws of nature (*OPA* 2:105). Kant even refers to "laws of freedom" for finite agents here (*OPA* 2:110–11). This could suggest a commitment to non-natural libertarian freedom, though this is debatable (Allison 2020, 72).

own accord" (*UNH* 1:223). So the general laws of nature, as well as created substances, make up the order of nature. These laws determine "the borderline that separates nature from the finger of God," an insight Kant attributes to Newton (*UNH* 1:339; *LM-Mr* 29:862).

Let us now turn to how this general picture affords an understanding of token necessary connections. Consider a causal power of a particular created substance. In virtue of their source in a created substance—or more accurately, given the Principle of Succession, in mutually interacting substances—this power's effects will be materially natural. For Kant, more is needed for the substance's effects to be formally natural. The power's manner of action must be "determined" by a further "ground" or "principle" ('ID' 2:390; *NE* 1:392–93; *LM-H* 28:49). As Laywine (2006, 81 n.11) notes, determination by some laws is required in order for the powers of a substance to bring about determinate effects (compare the Principle of Coexistence). The actual powers of finite substances are determined by laws, and also by the powers of the finite substances they interact with. This is why Kant can claim *both* that natural events "owe their necessity to laws," and that laws are in some sense "implanted" in natural events (*OPA* 2:111–12).

Is the relation between laws and powers one of efficient causation? Kant's answer seems to be *no*. On Eric Watkins's (2005) plausible reading, efficient causation for Kant is a type of real grounding by which substances actively produce effects. Events in nature are efficiently caused by natural forces or powers (*OPA* 2:105). Laws, which are not active substances, are not sufficient to produce effects.[34]

Even if laws do not count as efficient causes for Kant, he holds that they are necessary conditions (or criteria for the possibility) of particular events falling under them, such as the exercise of powers in a certain manner. Kant describes laws as *determinations*, broadly speaking, that need not be causal but can be "logical" or "mathematical" as well (*LM-H* 28:41–2; 28:22; *LM-Mr* 29:808).[35] How can this dependence relation be characterized, beyond the bare notion of a necessary condition? A well-known suggestion from David Armstrong (1983) appeals to the instantiation of universals. Instantiation is a helpful example of universals determining particulars. Armstrong conceives of universals as existing only insofar as they are instantiated. And Kant, for his part, at least holds that only those laws that are actually instantiated in created substances can determine actual causal powers. In other respects, Kant's view differs from Armstrong's. Kant prefers the language of formal determination to that of instantiation (*OPA* 2:104).

On this reading, the story about salt's necessary solubility in water will go as follows. The counterfactual Kreines considers—that a gold ring would be water-soluble if it had been made of salt—will depend not just on causal powers, but on laws as well. In a loose sense, Kant grants that salt is a natural kind or 'matter.' But it is composed of more fundamental kinds: so

[34] Here I concur with necessitation readers such as Messina (2017, 145): "laws are not themselves powers or forces—the law of universal gravitation is not what propels the book to the floor when it is dropped." Compare also Schaffer (2017, 21): "the laws [of nature] are not extra causes but separate factors that play the distinctive role of linking causes to effects."

[35] On causal and noncausal senses of '*Bestimmung*' in Kant, see Ameriks (2018) and Watkins (2019, 22–23).

salt is not a "prime" matter or kind (*LM-H* 28:48). Salt's solubility in water, for example, is not a fundamental force or power. Rather, solubility is one of various manifest causal properties that salt presents; these can in principle be reduced to more fundamental powers, and in particular to attraction and repulsion, as determined by the actual laws of nature.

Thus, in a possible world with powers of attraction and repulsion but different laws, salt might be physically impossible. Fundamental powers on their own are not sufficient to ground the manifest properties of salt, such as water-solubility. This property depends on a particular fit between basic powers and laws. For the Kant of the early 1760s, the laws in question include the least action principle. Since these powers and laws are common to all matter, questions about causal necessitation are not merely local after all. This is just what we might expect, given Kant's insistence that the "essences of created things" are "not alien to each other but are united in a complex harmony" (*OPA* 2:131). Given this metaphysical picture, we should be cautious in drawing any strong metaphysical conclusions about the respective role of powers and laws in the early Kant from an analysis of concepts of non-fundamental kinds, such as salt and gold.

In sum, the pre-Critical Kant defends a metaphysically robust conception of laws of nature as genuine grounds. However, laws are not substances with efficient-causal powers, but are perhaps best conceived as irreducible, real relations. We have seen that laws play a explanatory and metaphysical unifying roles, over and above what results from adding up particular substances and their powers. The case of the least action principle shows that lower-order laws or principles can themselves be unified by more general laws. Finally, laws play a crucial role in grounding natural necessity.

On my reading, Kant's account of natural necessity is complex and multilayered, drawing on a web of fine-grained distinctions. This is a departure from the simpler picture attributed to Kant during this period by necessitation accounts, which leaves little if any metaphysical work to be done by laws. A more nuanced reading does justice to Kant's ambitions, even at this early stage, to reconcile a number of competing pressures—metaphysical, scientific, theological—in a comprehensive philosophical account.[36]

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Bibliographic notes

Quotations from Kant's works cite the volume and page number of the Academy edition, except in the case of the *Critique of Pure Reason*, where I employ the standard A/B pagination. Unless otherwise noted, I use the translations of the Cambridge Edition of Kant's works (P. Guyer and A. Wood (eds.), 1992–), and the following abbreviations:

> *CPR* | *Critique of Pure Reason*, A/B-eds. (1781; 1787) (*Ak*. 4:5–252; 3:2–552).
> 'Earthquake' | "History and Natural Description of the most Noteworthy Occurrences of the Earthquake…" (1:429–461).
> *FS* | "The False Subtlety of the Four Syllogistic Figures" (2:45–61)
> 'ID' | *On the Form and Principles of the Sensible and Intelligible World* (2:387–419).
> *LL* | *Lectures on Logic* (vol. 24).
> *LM-H* | *Metaphysik Herder*, early 1760s (28:5–166)
> *LM-L_1* | *Metaphysik L_1*, 1770s (28:167–350)
> *LM-Mr* | *Metaphysik Mrongovius*, early 1780s (29:747–940)
> *LM-V* | *Metaphysik Volckmann*, 1784–5 (28:355–459)
> *LM-D* | *Metaphysik Dohna*, 1790s (28:615–702)
> *LRT* | *Philosophische Religionslehre nach Pölitz*, early 1780s (28:993–1126)
> *NE* | *New Elucidation of the First Principles of Metaphysical Cognition* (1:387–416).
> *NDMR* | "New Theory of Motion and Rest" (2:15–25).
> *NM* | "Attempt to Introduce the Concept of Negative Magnitudes into Philosophy" (2:165–204)
> *OPA* | "The Only Possible Ground of a Demonstration of the Existence of God" (2:65–163).
> *PM* | "The Employment in Natural Philosophy of Metaphysics combined with Geometry, of which Sample One Contains the Physical Monadology" (1:475–87)
> 'PE' | "Inquiry Concerning the Distinctness of the Principles of Natural Theology and Morality" (2:275–301).
> *UNH* | *Universal Natural History and Theory of the Heavens* (1:215–368).

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