

KANT AND THE LAWS OF NATURE

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Kant's Necessitation Account of Laws and the Nature of Natures

James Messina

7.1 Introduction

Kant's Critical works contain a revolutionary account of the epistemology and metaphysics of the laws of nature. In terms of the epistemology, Kant claims that we can have synthetic a priori knowledge of some very general laws of nature, a class that includes the so-called transcendental laws of nature, such as the law that every alteration has a cause, along with the closely related laws of mechanics, such as the law that "every change in matter has an external cause" (*MF* 4:543). In terms of the metaphysics, Kant claims that these laws do not merely describe the regularities that happen to obtain in our world; instead, they are governing principles endowed with nomic necessity. On these epistemological and metaphysical points, the Critical Kant's view contrasts sharply with Hume's. For Hume, to believe that such-and-such is a law is to believe, on the basis of experience and custom, that there is a certain constant conjunction among events in our universe (Bs follow As). Laws have no governing force – they do not, as it were, force events in the world to fall into any particular pattern – nor do they rest on any underlying necessary connections in nature.

One of Kant's most radical claims arises in the course of his attempt to explain how the most general laws are necessary, governing, and knowable a priori: the pure understanding is their legislator. Call this the Legislation Thesis. As Kant writes in the *Prolegomena*: "even though it sounds strange at first, it is nonetheless certain, if I say with respect to the universal laws of nature: *the understanding does not draw its (a priori) laws from nature, but prescribes them to it*" (*Prol* 4:320).¹ The reason objects of experience must obey the transcendental laws, and the reason we can know them a priori, is

¹ Cf. A127–128, B165, and *CJ* 5:167.

that they are the understanding's own subjective conditions of the possibility of experience.

These features of Kant's account of laws, painted in very broad strokes, are generally agreed on. There is, however, considerably less agreement when it comes to Kant's views on another class of laws: the particular, empirical laws of nature, which figure into specific sciences, like chemistry. What is it to be a *particular law* for Kant – what does their lawfulness consist in?² Do such laws have the governing character and nomic necessity of transcendental laws? In what manner are the particular laws epistemically and/or metaphysically grounded in the transcendental laws? How, if at all, are such laws knowable?

Up until recently, there were two major interpretations of Kant's account of particular laws of nature. According to Michael Friedman's interpretation, by applying our knowledge of the synthetic a priori laws to the relevant empirical data we are able to derive knowledge of the particular empirical laws. Particular laws themselves inherit the necessity and prescriptive character of the laws of nature that provide their epistemic basis. By contrast, on the Best System Interpretation, defended by Philip Kitcher, among others, there are certain empirical generalizations that we are justified in taking to be necessary and thus to be laws, but only in the context of an ideal systematization of the empirical data (Kitcher 1986).³ Metaphysically, particular laws are, or correspond to, the statements that would be regarded as laws in such a system. In apparent contrast to these older readings, the so-called Necessitation Account⁴ holds that particular laws have a necessity that is "as it were built right into the nature of things" (Watkins 2005: 346). Empirical objects that share a certain nature (e.g., salt) are bound to behave in accordance with certain rules given those natures. The Necessitation Account suggests that Kant has a "bottom-up"⁵ metaphysics of particular laws, whereby laws are grounded in the nature of things as opposed to being superimposed on them. As for the epistemology of laws, the Necessitation Account denies that particular laws in most cases are knowable by us at all. On both of these points, concerning the

² I owe this formulation of this question to Kreines 2009.

³ I borrow this label for Kitcher's position from Kreines 2009. The aptness of the label is supported by remarks like the following: "For Kant, the laws of nature are just the generalizations that would figure in the best unifying system in the limit of rational inquiry" (Kitcher 1996: 412).

⁴ Again, I borrow this label from Kreines 2009.

⁵ I borrow the language of top-down and bottom-up – which I explain below – from Ott 2009: 5–6 and Massimi 2014: 492–493.

metaphysics and the epistemology of laws, the Necessitation Account challenges the received picture of Kant.⁶

In this chapter, I have several aims. First, I will extend the case for the Necessitation Account, adding to the evidence that has been adduced by its proponents. Second, I will argue that the evidence supports an *expanded version* of the metaphysics of the Necessitation Account, whereby *all* laws of nature are necessary rules that are immanent to certain natures. Third, I will examine Kant's ontology of natures in order to clarify the metaphysical relationship between natures and laws, using as a foil for Kant's view a contemporary "bottom-up" version of the Necessitation Account. Here I argue that, while the existence of particular laws of nature is tied to the existence of empirical natures, they also have a priori grounds of possibility (not all of which are knowable by us) from which their modal force and content come. One interesting result here is that Kant's account is immune to the charge that has been leveled against some contemporary bottom-up versions of the Necessitation Account, namely, that they render laws of nature otiose (Mumford 2004: 121). Fourth, I respond to some possible objections to my expanded Necessitation Account.

7.2 Three Interpretations of Kant on Particular Laws of Nature

In contrast to the transcendental laws of nature, which are "pure" and govern the behavior of all objects of experience without exception, all more specific laws of nature have an experiential element and are restricted to a particular domain of objects. As a result of their empirical character, Kant says that "particular laws ... cannot be *completely derived* from the categories, although they all stand under them" (B165).⁷ Particular laws do not admit of either a metaphysical or a transcendental deduction, nor can they be justified through construction in pure intuition. Prior to all experience, it is impossible for the human understanding to know what empirical laws obtain and whether and to what extent those laws are related to each other in a tidy, hierarchical way (CJ 5:183).

Kant's various commitments regarding empirical laws have put close readers into a quandary.⁸ As we have just seen, Kant claims that (1) we don't have a priori knowledge of empirical laws. Kant also seems to claim

⁶ It is noteworthy in this regard that Brian Ellis places Kant alongside Descartes and Newton as a proponent of the top-down view (Ellis 2001: 1).

⁷ Cf. A127–128. ⁸ My formulation here has been influenced by Kitcher 1986: 208.

that (2) empirical laws, like all laws, involve some sort of necessity;⁹ (3) knowledge of necessity cannot be obtained empirically;¹⁰ and (4) we have knowledge of empirical laws.¹¹ It is not immediately obvious how (1)–(4) are to be reconciled with one another, particularly if one assumes that all knowledge is either empirical or a priori. In the effort to reconcile Kant's various commitments regarding particular laws, various interpretations have been developed.

Michael Friedman attempts to resolve the apparent tension in Kant's commitments by claiming that, while particular laws have an empirical component, this does not preclude a priori grounding as well – a grounding in a priori knowable laws (Friedman 1992b: 181). Textual evidence for such a view can be found in passages like the following:

Even laws of nature, if they are considered as principles of the empirical use of the understanding, at the same time carry with them an expression of necessity, thus at least the presumption of determination by grounds that are a priori and valid prior to all experience. But without exception all laws of nature stand under higher principles of the understanding, as they only apply the latter to particular cases of appearance. (A159/B198)

There are therefore certain laws, and indeed a priori, which first make a nature possible; the empirical laws can only obtain and be found by means of experience, and indeed in accord with its original laws, in accordance with which experience itself first becomes possible. (A216/B263)

Friedman understands Kant to be claiming here that particular empirical laws, while not derivable from the a priori laws of nature in isolation from experience, can be derived from such laws when they are applied to the relevant empirical content (Friedman 1992b: 174).

There are two classes of particular laws to consider. On the one hand, there are the laws of mechanics. These are deduced by applying the transcendental laws to the empirical concept of matter (Friedman 1992b: 185). On the other hand, there are "mixed" laws like the law of universal gravitation. Knowledge of such laws requires a substantial empirical component. For example, in the case of the law of universal gravitation, it depends on Kepler's laws, which are strictly speaking inductively obtained rules, not laws, because they lack necessity (*Ref. 18:176* [R5414]). While induction on its own cannot give us knowledge of the law of universal gravitation, we can deduce this law from the inductively attained

⁹ For the claim that laws involve necessity, see A113, *MF* 4:469, A159/B198 (quoted below), *CJ* 5:184–185, and *Ref. 18:176* (R5414).

¹⁰ See, e.g., A1 and B3. ¹¹ E.g. *CJ* 5:184–185, quoted in Kitcher 1986: 208.

regularities by availing ourselves of the a priori laws of mechanics, along with certain assumptions (Friedman 1992b: 175–178).¹²

Friedman's account, which we might call the Derivation Account (DA), does not merely concern the epistemology of particular laws. It also has implications for the metaphysics of such laws. On the DA, particular laws are those the knowledge of which can be attained by applying a priori principles to experience (Kreines 2009: 528). Particular laws possess genuine nomic necessity, one that is "injected" into them by the transcendental laws (Friedman 1992b: 175). They are not, as on the Humean account, mere regularities that happen to obtain in nature, but rather are rules that govern how nature must behave.

The DA contrasts with the Best System Interpretation (BSI) defended by, among others, Philip Kitcher.¹³ Kitcher's way of resolving the tension among (1)–(4) is to claim that

taken individually, statements that we normally count as laws can only be regarded as empirical and contingent. But, we are required to systematize the body of our beliefs, and as consequence of the systematization, some statements (in fact those we count as laws) come to be credited with necessity. (Kitcher 1986: 209)

Considered apart from other beliefs, a belief in a true empirical generalization that is arrived at through induction does not constitute knowledge of a law, since induction cannot justify a claim to necessity. This is how Kitcher construes Kant's commitment to (3) above. But the belief that the generalization has necessity and is a law is justified *if* the generalization plays a particular role¹⁴ in an ideal systematization of our empirical beliefs (Kitcher 1986: 210). Such an ideal systematization would be based on all empirical data and be guided by certain methodological rules. This is how Kitcher makes sense of (4). Kant's accounts of systematic unity, and his views on the methodological rules that guide the process of systematization, can be found in the Appendix to the Transcendental Dialectic and in the introduction to the *Critique of Judgment*. These methodological rules tell us, among other things, to bring particular empirical beliefs into a

¹² While Kant's remarks on the law of universal gravitation at *Prolog* 4:321 might seem to suggest that Kant believes that it is possible to give a purely geometric derivation of the law, it is generally agreed that this is not the right way to read the passage.

¹³ Other versions occur in Buchdahl 1965, Brittan 1978, and Allison 1996.

¹⁴ Unfortunately, it is unclear exactly what role the generalization would have to play in order to be justifiably deemed a law. Presumably, the generalization would have to be essential for unifying lower-level regularities and be couched in terms of empirical concepts that similarly unify lower-level empirical concepts.

hierarchy of progressively more general beliefs that has the right balance of simplicity, fruitfulness, and continuity. The belief hierarchy thereby constructed will contain beliefs in empirical generalizations that we are justified in regarding as necessary laws, given the role they play in the construction.

The BSI is not simply an interpretation of Kant's epistemology of particular laws. Like the DA, it is also an interpretation of the metaphysics. For Kitcher, particular laws of nature will be, or will correspond to, those empirical generalizations that are deemed to be laws in a best system (Kitcher 1986: 214). In contrast to the DA, the necessity of particular laws is not "injected" into them by the transcendental laws, but has a different provenance in the cognitive faculties responsible for systematization: reason and/or reflective judgment. The necessity is of a kind different from the necessity of transcendental laws and is harder to get a grip on. With regard to the latter point, it is not clear how connecting a generalization systematically with other generalizations could change its modal character. With regard to the former point, the laws in question cannot be *governing* principles. On the BSI,¹⁵ particular laws do not *explain* why their associated regularities must obtain, but rather are part of an ideal codification of the regularities that happen in our world (Kreines 2009: 549–550). For these reasons, the BSI makes Kant a kind of Humean about particular, empirical laws.¹⁶

Recently, a new reading of Kantian particular laws of nature has emerged, the so-called Necessitation Account (NA), aspects of which have been defended by Watkins and Kreines. According to Watkins, "laws of nature are nothing other than the laws of the natures of things. That is, the laws of nature that hold in a given world are a function of the natures that are instantiated in that world" (Watkins 2005: 335). Kreines speaks of particular laws obtaining in virtue of the nature of specific kinds of things.

¹⁵ Recently, McNulty has developed an interesting reading of Kant's account of particular laws of nature that builds on some of the ideas of the BSI while avoiding its shortcomings. On McNulty's "ideational interpretation," ideas of pure reason play a crucial role in accounting for necessity (McNulty 2015: 2). Unfortunately, I do not have space to evaluate McNulty's reading here.

¹⁶ This is notwithstanding Kitcher's own claims about the anti-Humean character of Kant's view. Kitcher takes Kant to be arguing in the Second Analogy that "there is no justifying straightforward empirical claims, descriptions of Hume facts, without justification of causal claims." He takes Kant to be arguing in the Appendix to the Transcendental Dialectic that these causal claims are justified "through the incorporation of statements within a unified system" (Kitcher 1986: 221). These causal claims are precisely the kind whose legitimacy was contested by Hume. They "imply" generalizations that legislate for unactualized possibilities" (Kitcher 1986: 219). The problem is that it is far from clear that Kitcher's Kant can have such a robust notion of causation and of laws.

He uses the example of the solubility of salt. If indeed it is a law that salt is soluble, this is so because of the nature of the kind salt (Kreines 2009: 531–532). Anything with this nature will necessarily be disposed to dissolve in water. Like the DA, the NA takes particular laws to possess necessity and governing force. They do not merely reflect regularities that happen to obtain, but rather also serve to explain them. However, in apparent contrast to the DA, the necessity in question "is built right into the nature of things" (Watkins 2005: 346).

The NA suggests that Kant is working with a "bottom-up" model of laws. While top-down models take the laws of nature to be transcendent principles that are imposed from the outside on things that could retain their essential properties apart from those laws, bottom-up necessitation accounts deny these claims: laws supervene on the natures and/or essential properties of objects (Ellis 2001: 1; Ott 2009: 5–7). Historically, top-down models of laws invoked God as a legislator, identifying laws of nature with features of God's will, such as divine general volitions on the Occasionalist position. Contemporary top-down models of laws invoke universals that stand in sui generis necessitating relations to each other, relations that vary from possible world to possible world, resulting in corresponding changes to the laws.¹⁷ Such a view disconnects laws from the essential properties and natures of the things that they govern. By contrast, so-called dispositional essentialism, defended by Brian Ellis, is a contemporary bottom-up model of laws that says that laws of nature derive from the essential properties of things and accompany those properties in all possible worlds (Ellis 2001: 4).¹⁸

That should suffice for now as a preliminary characterization of the metaphysics of laws ascribed to Kant on the NA. What about the epistemology? Kreines's manner of resolving the apparent conflict between (1)–(4) is to deny (4): the particular laws of nature are not, except in the very special case of the laws of mechanics, knowable.¹⁹ In contrast to

¹⁷ E.g. Armstrong 1983, Dretske 1977, and Tooley 1977. For a helpful summary, see Mumford 2004. Admittedly, Watkins initially likens Kant's account of laws to Armstrong's top-down model. But in his discussion, he stresses weaknesses in Armstrong's account that derive from (what I am calling) its top-down aspects and corresponding ways in which Kant's account avoids these problems, though Watkins appears officially noncommittal about whether Kant's account is bottom-up (Watkins 2005: 402–407). At one point, Kreines professes himself agnostic on the question about whether particular natures could retain their identity while obeying different laws (Kreines 2009: 533). But this seems to run contrary to the idea that the natures of kinds provide a deep explanation for why the regularities that obtain do and must obtain (since it would be possible for those natures to exist without supporting those regularities); moreover, it is hard to see what the nature of something like salt could consist in if it is not bound up with obeying certain laws.

¹⁸ Ellis 2001: 4. ¹⁹ It is unclear whether Watkins agrees with Kreines on this point.

Friedman and Kircher, who define what particular laws are in terms of the ways in which we come to know them as laws, Kreines separates the metaphysical from the epistemic question. Once we do that, there is no contradiction in the idea that there are nomically necessary, governing laws, which we are nevertheless prevented from knowing as laws because of our epistemic limitations (Kreines 2009: 528). The limitations are due to the fact that particular laws involve empirical kinds whose properties and relationships to each other we can generally find out only through empirical intuition. And empirical intuition can tell us only what patterns happen to be the case, not that must be the case (Kreines 2009: 540). The only case where we can have knowledge of particular empirical laws is when the laws involve a single kind that stands in a particularly close connection with our pure intuition of space: namely, matter. This is true of the laws of mechanics, but it is a very special case (Kreines 2009: 540, 543).²⁰

7.3 A Case for an Expanded Version of the NA

In this section, I evaluate the case for the metaphysics of the NA. After first adding to the evidence provided by Watkins and Kreines, I then raise some clarificatory questions and objections that I will address in subsequent sections.

Watkins's case for the metaphysics of the NA rests on a sophisticated, historically sensitive interpretation of Kant's model of causality. Crucial to this model is the notion of causal powers that substances exercise in accordance with their natures. Watkins also provides an attractive reading of the resolution to the Third Antinomy wherein the idea that laws of nature are laws of natures plays a crucial role (Watkins 2005: 334).²¹ Kreines's case for the metaphysics of the NA begins with some remarks in the Transcendental Dialectic that he takes to commit Kant to a

particular view of explanation, which he calls the *simple intuition*: "explanation must provide information about an underlying condition on which an explanandum really depends" (Kreines 2009: 531). Now, we typically invoke laws to explain regularities, like that Bs regularly follow As. Kant's view of explanation rules out a Humean understanding of particular laws because then laws will merely restate the regularity in question. Instead, the simple intuition points us toward a model of nomic explanation whereby laws "provide information about an underlying condition on which the regularity *depends*, namely, the nature of the kind" (Kreines 2009: 532). Laws based in natures will explain not just why the Bs we have seen have regularly followed As but also why any future or counterfactual cases of As would have to be followed by Bs. Admittedly, the DA appears similarly well equipped to accommodate the simple intuition. However, Kreines argues that this reading would have the unacceptable consequence of denying the status of laws to any laws that cannot be derived from a priori principles, as appeared to be the case for chemical laws during Kant's time²² and that will be the case for any laws that involve fundamentally distinct kinds (Kreines 2009: 541).

I think we can add to the case for the metaphysics of the NA. A philosophical consideration that supports the idea that Kant does not in general make the conditions on being a law dependent on the conditions under which laws are known, as on the DA and BSI, is that he countenances at least the possibility of lawfulness at the level of things-in-themselves, despite our lack of epistemic access to them: "The lawfulness of things-in-themselves would necessarily pertain to them even without an understanding that cognizes them" (Br64). Only a nonepistemic account of laws, such as the NA, is consistent with the idea of lawfulness at the level of things-in-themselves – particularly if the laws are governing principles endowed with nomic necessity.²³

The NA also gains some modest support from the details of the development of Kant's thinking about laws. Michela Massimi has argued persuasively that the pre-Critical Kant endorses a dispositional essentialist model of laws, whereby as she puts it, "physical necessity . . . is grounded in nature's capacities and natural powers, from which laws of nature are read off" (Massimi 2014: 493). In texts such as the *Universal Natural*

²² McNulty 2015: 2 makes the same point.

²³ I am assuming here that Kant would prefer a uniform account of what it is to be a law of nature to one that would make the lawfulness of particular laws fundamentally different from the lawfulness of noumenal laws and transcendental laws.

²⁰ One might wonder what implications Kreines's view has for our knowledge of particular causal relations. If he were to construe Kant as holding that knowledge of a particular causal relationship requires knowing some particular empirical kind along with the laws sustained by that kind, then Kreines would have to say that in general Kant precludes our knowing particular causal relations. However, Kreines does not commit himself to the antecedent here.

²¹ The idea, briefly, is that my phenomenal self's being determined by prior events and the laws of nature to, say, ignore the pleas of the homeless person on the street is compatible with this being a free act because my noumenal self freely decided the nature of my phenomenal self, and the latter in turn partly grounds the particular laws of nature my phenomenal self is subject to. In this way, my noumenal self's choice helps to determine the laws of nature, which includes laws of the nature of my phenomenal self.

History and *Only Possible Argument*, Kant claims explicitly that the necessity of the laws of mechanics is rooted in the essence of matter, such that it is impossible for matter to exist as matter and yet operate according to different laws (*OPA* 2:100).²⁴ The necessity of other laws likewise follows from the essences of the relevant kinds of things: “But that a celestial body in its liquid state should, entirely necessarily and as a result of such universal rules, strive to assume a spherical form . . . that is inherent in the essence of the thing itself” (*OPA* 2:102). For the pre-Critical Kant, the essence or nature of a thing involves fundamental causal powers (or forces) and necessary rules that direct their operations. Particular laws cannot exist without there being causally active natures to support them, and those natures cannot themselves exist without following these particular laws. In this respect, natures are “tied” to laws (*UNH* 1:227).

The character of Kant’s pre-Critical account of laws can be brought out by comparing it with some of the historically available models of laws of nature that were likely to have influenced him. On the one hand, there is the top-down model of the laws of nature offered by the Occasionalists. For Malebranche and those of his ilk, laws of nature are simply God’s general volitions. The things that exist are not essentially bound to obey the laws that they do – God could in principle have created those same things while having them obey different laws. Finite substances lack causally active natures; it is the laws superimposed on them that are the true causes of their properties, relations, and behaviors. Some Newtonians, like Newton himself and Roger Cotes, are also attracted to a top-down model of laws (Massimi 2014: 494–495; Ott 2009: 7), though they do not go as far as the Occasionalists in denying to finite substances causally efficacious natures. By contrast, Leibniz’s account of laws of nature is bottom-up. For Leibniz, regularities in nature are to be explained in terms of the essential natures of substances; these natures are, or include, forces or dispositions that operate according to in-built, necessary rules (Adams 1994: 313–314; Rutherford 1993: 140–141).²⁵ Any occurrences that are not explicable through the natures of substances are *supernatural*.²⁶ Insofar as the Occasionalists take all occurrences in the natural world to be this way, and the Newtonians everything involving gravity, Leibniz complains that

²⁴ This is how I understand Kant’s reference to “logical necessity” (*OPA* 2:100).

²⁵ Leibniz describes natures in *On Nature Itself* as “created, active force” (Leibniz 1989: 156) and “a certain efficacy [that] has been placed in things, a form or force” (Leibniz 1989: 159).

²⁶ In the *Discourse on Metaphysics* he says that “that which is limited in us could be called our nature or our power and in that sense, that which surpasses the natures of all created substances is supernatural” (Leibniz 1989: 49).

they unduly multiply the supernatural (Leibniz 1989: 143, 336). Of these accounts, the pre-Critical Kant’s is clearly closest to the Leibnizian. This is what allows Kant to work with a broadly Leibnizian account of supernatural occurrences in the *OPA*, whereby these involve events that are not explicable through the forces and rules inherent in the natures of things (*OPA* 2:104ff.).

Why not think Kant’s pre-Critical account of laws is just another of the fanciful dreams that Kant dreamed during his dogmatic slumber? There are various considerations that point toward Kant’s continued adherence to some version of a bottom-up necessitation account in the Critical period, despite radical shifts in his thinking about the natural world and the conditions of our knowledge of it.

First, there is the fact that Kant does not abandon the language of essence and nature in the Critical Period. It continues to occupy a prominent place in his writings on the topic of natural science, for example, the *Metaphysical Foundations* (*MF* 4:467–468). Moreover, there is a natural way of reading this text in which its goal is to reveal as before, albeit within a radically new philosophical framework, the forces and laws that necessarily attach to all matter in virtue of its nature. The causal powers essential to matter include attraction and repulsion, while the laws include Kant’s three laws of mechanics and the law of universal gravitation.

Second, there are texts from the late pre-Critical through to the Critical period in which Kant underscores the close relationship between laws and natures. In the *Metaphysics L*, for example, transcripts of lectures given in the 1770s, Kant says that “every nature has laws” (28:216). In a thematically related reflection from the 1780s, he says that something is “contrary to nature [*Naturwiedrig*] insofar as it contradicts [*widersteht*] the laws of the nature of a thing [*den Gesetzen der Natur eines Dinges*]” (*Refl.* 18:180 [R5432], emphasis added). The context of the former remark is significant insofar as it reveals Kant’s continued adherence to a Leibnizian account of the supernatural, an account that fits naturally with a bottom-up model of laws.

Such claims are not confined to unpublished reflections and lecture transcripts. In the introduction to the *Critique of Judgment*, Kant writes that

specifically different natures, besides that which they have in common as belonging to nature in general, can still be causes in infinitely many ways; and each of these ways must (in accordance with the concept of a cause in general) have its rule, which is a law, and hence brings necessity with it, although given the constitution and the limits of our faculties of cognition we have no insight into this necessity. (*CJ* 5:183)

What such passages indicate is that in the Critical period Kant continues to think that each empirical nature is associated with distinctive causal powers and general, necessary rules according to which these powers operate. Specific empirical natures cannot exist without bringing with them laws, which lead to regularities in the effects produced by them. This is so even if we cannot know what the laws are and whether and to what extent there are any substantive connections between the empirical laws governing different natures.

Significantly, though, the Critical Kant's views on the connection between laws and natures do not appear to be restricted to *particular* empirical natures and *particular* empirical laws. Kant also has a notion of "Nature in general" (referenced in the immediately quoted passage), by which I take him to mean both the essential structural aspects of the empirical world *and* a most general nature common to, and contained in, all particular empirical natures, in the same way that the nature of metal is common to, and contained in, the natures of gold and lead.²⁷ Just as particular, empirical natures are necessarily accompanied by their corresponding particular laws, so Nature in general is necessarily accompanied by the transcendental laws of nature: neither can exist without the other. Though the possibility of Nature in general is due to transcendental laws (B165; A216/B263), these laws have no application or significance apart from that nature (A160–161/B200–201). Both empirical and transcendental laws require some nature for their realization, just as both particular natures and Nature in general can exist only if accompanied by their associated laws.

I take the considerations presented in this section to show not just that proponents of the NA are on to something but that the NA should be extended beyond particular empirical laws to transcendental laws and noumenal laws (if there be any such). It is time to begin clarifying the NA and addressing objections to the extended version of it.

Just what are natures for Kant? How exactly should we understand the connection between laws and natures? I take the NA to posit a necessary connection between natures and their corresponding laws, such that the relevant laws always accompany the relevant natures and vice versa, but this is consistent with different models. Brian Ellis's dispositional essentialist account is one such model. For Ellis, there are various natural kinds, and there are properties that are essential to members of these kinds. The laws of nature derive their content and modal force from these essential

properties, some of which are dispositional. For example, there is a law to the effect that electrons have negative charge, and this arises from the fact that negative charge is essential to being an electron. Facts about laws, which have the force of metaphysical necessity, reduce to facts about essential properties of kinds of things (Mumford 2004: 106–109). This has led Stephen Mumford to object that the reductionist view is actually inconsistent with a governing account of laws. The problem is that if laws reduce to a fundamental base in the essential properties, then laws cannot be said to determine the base. As he puts it: "The laws merely ride on the back of these properties but, unlike jockeys on horses, cannot claim any credit for the direction the properties take" (Mumford 2004: 121). Is the Critical Kant working with a reductionist model like Ellis's that is open to this objection, or some other model? In Section 7.4, I attempt to answer this question after first trying to clarify the nature of a nature for Kant. In the conclusion, I then draw on this clarification to respond to two objections to the expanded NA.

7.4 The Nature of Natures and Laws

In the *Metaphysical Foundations*, Kant distinguishes between the term "nature" in its "formal" and "material" meanings. The latter refers to the sum total of all the objects of experience. Nature in its formal meaning, by contrast, refers to the "first inner principle of all that belongs to the existence of a thing" (MF 4:467). In this sense of the term, which is the one that matters for our discussion, we can speak of the natures of particular individuals and kinds of things (e.g., "fluid matter" and "fire" [A419n/B446n]), as well as of Nature in general.

Kant's definition, which is not unique to this text,²⁸ is rather obscure and itself in need of clarification. Since Kant tends to use the terms "nature" and "real essence" interchangeably, we can start by looking at what he says about real essences in the logic and metaphysics lectures.²⁹ Kant contrasts real essences with logical essences. The logical essence of a thing or kind of thing consists in the fundamental conceptual marks that are necessary for us to think of it. By contrast the real essence of a thing is "the first basic concept of everything that really and in fact belongs to the thing" (24:1116). The properties that are essential for us to think of

²⁸ Cf. *Ref.* 18:180 [R5:431] and 28:215–216.

²⁹ See 24:840 (from the *Vienna Logic*, transcripts of logic lectures that Kant gave around 1780) and 24:728 (from the *Dohna-Wundlacken Logic*, from the early 1790s).

²⁷ See B165 and MF 4:472.

something – those comprising its logical essence – need not be properties that are genuinely necessary for the thing. Real essences correspond to real definitions. Judgments about the properties belonging to, and resulting from, the real essence are synthetic rather than analytic (28:820).

But not everything that admits of a real definition and is the subject of synthetic judgments has a nature. Geometric figures satisfy these conditions, but Kant says they merely have essences rather than natures, because “in their concept nothing is thought that would express an existence” (MF 4:467n). What do we have to think in the concept of a thing for it to “express an existence” and thus for us to ascribe a nature to it? The answer, I think, is causal power. This I take to be the ability of a substance to ground the existence of determinations in itself – that is, positive states and behaviors – and to bring about changes in the determinations of other substances. The grounding in question is not logical, as is the case when a property follows from a concept in accordance with the law of noncontradiction, but rather “real.” Remarks such as the following leave little doubt that Kant is thinking of fundamental causal powers as the “first inner principle[s] of the existence of a thing”:

It [i.e. the nature of a thing] concerns power and activity, the essential power is therefore the nature of the thing. E.g. The nature of quicksilver must contain the real ground of all of its consequences, i.e. the power, e.g. weight, fluidity, mobility. (28:49)

The general real ground of the determinations inhering in a thing is nature; thus, that through which according to a general law, it is determined what belongs to the predicates of its existence. (*Refß* 18:180 [R5432])

Attractive force, for example, is one of the powers included in the nature of matter. This force is the ground for the fact that all matter exists with the following determination: it falls when it is dropped. As for quicksilver, Kant does not pretend to know the fundamental powers that belong to its nature, but whatever they are, they are the ground of the existence of its various states and of the changes it brings about in the states of other substances. As for Nature in general, there are no particular powers that belong to it, since as something common to all particular empirical natures it is nonspecific, but I would suggest that the concept of it includes the idea of causal power in general.

Let's turn to the issue of the connection between natures and laws. In the *Metaphysical Foundations*, Kant says that “the word ‘nature’ already

carries with it the concept of laws, and the latter carries with it the concept of the necessity of all the determinations of a thing belonging to its existence” (MF 4:468). Putting this together with the previous points, I understand laws of nature to be rules that dictate the manner in which determinations must follow from the powers included in the nature of a thing. Laws do this by determining how the powers are exercised. For example, the law of universal gravitation dictates that bodies will attract one another to a degree directly proportional to their mass and inversely proportional to the square of their distance. The transcendental laws do not necessitate the existence of particular determinations, but they do provide some general constraints on the manner in which powers are related to determinations: for example, no change in a determination can occur without the exercise of some power of a substance.

So understood, 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. Instead, the laws are, as it were, operating instructions included in the nature of a substance along with its powers. All particular natures have the transcendental laws that go along with Nature in general as very general operating instructions, along with a set of particular laws. Natures cannot exist without the laws that regulate the operation of the powers associated with them, and these laws cannot change without the natures being other than they are (whether it be a particular empirical nature or Nature in general). But laws likewise cannot exist without natures, since they presuppose powers whose efficacy is in need of regulation; they lack any inherent powers. The notion of a law of nature without a corresponding nature makes as little sense as a nature without a law.

In these respects, Kant's account of laws of nature is bottom-up. Is the account reductionist like Ellis's? I don't think so. For Ellis, the content and governing power of laws arises out of their essential properties, some of which are dispositional properties, similar to Kant's causal powers (Ellis 2001: 4–5). But Kant doesn't view the causal powers as giving rise to laws, since the latter have the job of directing the former; while the laws and causal powers are posited together with the nature of a given substance, and always go together, they are distinct aspects of it. Kant's position is thus not vulnerable to Mumford's objection.

If the content and governing power of laws is not reducible to features of the causal powers included in the empirical natures, where do they come from? I offer the following as a somewhat speculative answer to this difficult question. There is considerable evidence that

Kant thinks of all laws of nature as having a priori grounds. This was one of the key motivations for the DA. Now, the DA assumes that the a priori grounds in question must be epistemically accessible to us, since in the case of empirical laws, we must be able to use them to deduce the empirical laws from the empirical data. This led to the unfortunate result that empirical laws that cannot be deduced in this way – of which there is reason to think there are many – cannot be laws. But how can the NA itself make sense of Kant's insistence on the role of a priori grounds?

My suggestion is that we need a distinction between different types of a priori grounds of laws – ones that are epistemically accessible to us and ones that are not. What unites such grounds is that they are conditions of the possibility of the empirical natures associated with the laws. The complete set of a priori grounds for a given empirical nature will provide the full explanation for the nature and the corresponding laws being as they are. For such grounds to be epistemically accessible to us, they will typically have to be subjective conditions of our experience of the empirical nature in question, involving aspects of our pure understanding and/or sensibility. But laws can also have grounds of possibility that have nothing to do with us as subjects, in which case, while we might perhaps be able to see what the rules associated with them are, we can't understand why the content of the rules must be the way it is, and why things with that nature must behave in that fashion. But this does not foreclose the possibility of another being having a priori insight (working with the grounds of possibility) to grasp what we are missing.

Consider the transcendental laws, for example, the causal principle. The content of this rule and its necessity is comprehensible to us because it is, or can be deduced from, subjective conditions of the possibility of our experience of Nature in general. Something similar holds of the laws of mechanics. The content and necessity of these laws has its basis in subjective conditions of the possibility of our experience of the empirical nature of matter (the object of the empirical concept of matter). In particular, they are based on principles of the pure understanding (the transcendental laws of nature) and on aspects of our pure sensibility, particularly our ability to mathematize various aspects of the content of the empirical concept of matter. For this reason, we can see why it belongs to the nature of matter to act according to these particular mechanical laws and no others.

The case is different for other particular empirical laws, like the laws of chemistry. Kant is famously skeptical of our ability to come to know

chemical laws because of their nonmathematical character (*MF* 4:471). I take it this is because their lack of mathematical content is an indication that the laws have their basis in a priori conditions of the possibility of the chemical natures in question to which we lack epistemic access. Such conditions would presumably involve features of the noumenal world (e.g., the noumenal natures that ground those chemical natures, and/or aspects of a divine understanding's manner of cognizing those natures). Though an a priori justification-cum-explanation of the chemical laws exceeds our abilities, it is not necessarily beyond the cognitive powers of another being (like God).³⁰

7.5 Conclusion

In this chapter, I have tried to argue for, extend, and clarify the Necessitation Account. The NA was originally offered as an account of the particular laws of nature. Its core epistemic thesis is that particular laws are not necessarily knowable by us; its core metaphysical thesis is that Kant conceives of particular laws in terms of particular empirical natures, the positing of which necessitates certain regular behaviors. I argued that transcendental laws of nature, as well as noumenal laws (if there are any such) are similarly associated with natures. In the case of transcendental laws, the nature in question is Nature in general, which might be thought of as a completely general nature common to and contained in all particular empirical natures. The positing of this nature brings with it the transcendental laws and indeterminate causal power associated with it. In this respect, Kant has a uniform metaphysics of laws of nature.

The relationship between laws and natures was not initially clear. As I understand it, Kant holds that natures cannot exist apart from their associated laws, and those laws cannot exist apart from (must be realized within) their associated natures. This is the sense in which laws are inherent in natures and Kant's model of laws is bottom-up. However, the Critical Kant does not endorse a reductionist model like Ellis' dispositional essentialism. Laws do not reduce to the causal powers that define a given

³⁰ The law of universal gravitation is yet a third kind of case. Kant thinks that universal attraction is essential to matter and that this property is "comprehensible a priori" (*MF* 4:518). In addition, he clearly thinks we are justified in believing that masses attract one another in a manner inversely proportional to the square of the distances and directly proportional to their masses. But as for *why* the content of the law is precisely thus, i.e., why attractive force behaves in precisely this way, I take it the reason lies in a priori noumenal conditions of the possibility of matter to which we lack cognitive access.

nature but are a separate aspect of that nature, albeit one no more detachable from the nature than the causal power is. The law of a given nature, I suggested, acquires its content and necessity from the a priori grounds of the possibility of that nature. These grounds are not always epistemically accessible to us.

Let's close by addressing two objections to the expanded NA. The first concerns the apparent inconsistency between what it says about transcendental laws and Kant's Legislation Thesis. Kant's account of transcendental laws might seem to be a paradigmatic top-down model, with the human understanding playing something like the role that the divine will plays on the Occasionalist model of laws: superimposing laws onto a natural order that is not inherently lawful.³¹ I think this is the wrong way to think about transcendental laws. Indeed, these laws have their source in the pure understanding. But it is also true that the transcendental laws are part of the identity conditions for all empirical natures; those natures would not be the natures that they are, would not be empirical natures, without conforming to the transcendental laws. The transcendental laws, in turn, exist as laws only insofar as there exists a Nature in general for them to inform. The Legislation Thesis is consistent with a bottom-up model of laws of this sort, whereby laws and their associated natures always exist together.

The second objection concerns the apparent inability of the NA to make sense of the manner in which particular laws of nature do not simply have an a priori ground but are grounded at least in part in transcendental laws. One passage indicative of this commitment was discussed in the context of the DA: "all laws of nature stand under higher principles of the understanding, as they only apply the latter to particular cases of appearances" (A159/B198). For Friedman, this is evidence of a relationship of epistemic dependence between the transcendental laws and the particular laws, such that particular laws can be deduced from the transcendental laws (and sometimes mechanical laws) in conjunction with the empirical data. What can the extended NA say about this? The reason that particular laws of nature stand under the transcendental laws is that the particular empirical natures associated with those laws all have in common a most general nature, Nature in general. In line with this, Kant speaks of the particular natures as "modifications" of the transcendental concept of nature, which corresponds to Nature in general (*CJ* 5:179). Insofar as this

³¹ I take it this is the picture Ellis (2001: 1) has in mind when he groups Kant with proponents of a top-down model of laws.

Nature is governed by inherent transcendental laws, all of the particular empirical natures that are its specifications are governed by these laws as well. For this reason, all particular laws are subject to the general constraint that they do not violate the transcendental laws (B165). But this does not mean that we need be able to deduce all particular laws from the transcendental laws, even with all available empirical data, because in many cases these particular laws derive from conditions of possibility to which we lack epistemic access.