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ARTICLE

The Necessity of Empirical Laws of Nature through the Lens of Kant's Dialectic

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Abstract

This article analyses a sceptical challenge resulting from metaphysical approaches to the problem of the necessity of empirical laws of nature in Kant's critical philosophy (what I shall call 'essentialist' readings). I argue that this challenge may jeopardize the purpose of empirical enquiry (and therefore the plausibility of essentialist readings), but that Kant has internal resources to address it in the Dialectic of the *Critique of Pure Reason*. I show that reading this problem through the lens of the Dialectic allows us to reconcile the metaphysical question of necessitation of laws with a robust sense of empirical cognition.

Keywords: laws of nature; essentialism; ideas of reason; systematicity; empirical cognition

1. Introduction

What grounds the necessity of empirical laws of nature for Kant? An influential answer in the literature is what I shall call the 'essentialist' account of laws (e.g. Kreines 2008; Stang 2016; Messina 2017). Minimally, this account argues that the necessity of empirical laws is grounded in the 'essences' (or 'natures') of things. This view aims to provide a more robust explanation of the metaphysical origin of necessity than traditional accounts that derive the necessity of laws from our cognitive faculties, such as the so-called 'Best System' account (e.g. Brittan 1978; Kitcher 1986; Guyer 1990) and the 'Derivation' account (Friedman 1992).[1] However, such metaphysical grounding also has a high epistemic cost. To put it briefly, knowing something requires, for Kant, 'objective sufficiency' or 'certainty' (*CPR*, A822/B850),[2] which seems to be unavailable in the case of essences of things.[3] But if essences are beyond the possibility of knowledge, proponents of this view need to maintain that we cannot properly know empirical laws.

I suggest that such nomological ignorance is more problematic than commonly acknowledged, for it may jeopardize the very purpose of empirical enquiry. In particular, the following sceptical challenge results from this position. If we cannot have knowledge of empirical laws, it is unclear (i) why we should attempt to acquire and improve cognition of laws at all; and (ii) how we should go about it. In other

words, we are owed an explanation of whether and how some genuine cognitions of laws – understood in a broad sense, i.e. as fallible, yet epistemically valuable judgements – are possible.[4] In fact, a sceptical position that simply denies that there is such a thing as empirical cognition of laws would seem more consistent with the epistemic constraints of essentialism. To answer the challenge, an essentialist should make room for some form of epistemic access to essences, but this, as we will see, seems to be incompatible with Kant's own epistemic restrictions.

I argue that Kant's theory of reason has internal resources to address this challenge. In the Dialectic, Kant famously reconstructs reason's tendency to answer metaphysical questions and go beyond the boundaries of possible cognition. The Dialectic, however, also contains a positive doctrine that transforms this rational tendency into an epistemic source for empirical investigation. I argue that it is possible to apply Kant's considerations to the problem of empirical laws of nature, and that reading this problem through the lens of the Dialectic allows us to reconcile the metaphysical question of necessitation of laws with a robust sense of empirical cognition. I show, first, that although we cannot know essences, we can think them as ideas of reason. And second, that thinking of essences as ideas of reason allows us to get epistemic access to comparatively inner properties that have ontological and epistemic priority over mere regularities. As a result, this interpretation accommodates two apparently incompatible intuitions that underlie Kant's philosophy of nature, namely that we cannot properly know laws of nature, but that we can acquire and improve our cognition of them.

2. Essentialist accounts of empirical laws

Let's start with a brief (by no means exhaustive) overview of the debate on the necessity of Kant's laws of nature.[5] Two main views have been traditionally proposed to explain the origin of the necessity of empirical laws: the Best System account (defended, among others, by Brittan, Kitcher and Guyer) and the Derivation account (Friedman). Both views locate the origin of necessity of empirical laws in our cognitive faculties. According to the Best System account, necessary laws result from the inclusion of empirical regularities into a maximally unified system of cognition. For Friedman, empirical laws acquire necessary status when they are derived from the principles of the understanding in conjunction with the relevant empirical content through an iterative (and potentially infinite) process.

Both accounts have been object of extensive criticism. Beside turning Kant into a Humean about laws, Best System readings inherit the main problem that systematic theorists face in contemporary debates. Namely, that the epistemic criteria we use to systematize regularities (typically, simplicity and strength) fall short of assuring objectivity. It is possible to conceive of genuine laws that hardly contribute to the strength or simplicity of any system. But since these genuine laws would not be considered as such, it follows that what works in a system of regularities does not necessarily reflect an underlying order of nature. Friedman's account suffers from equally serious problems. First, it is questionable that Kant ever endorsed the project of grounding all empirical laws as such in the laws of the understanding (see e.g. *CPR*, A127). And even conceding that empirical laws can be so grounded in other laws, it is still unclear what really necessitates specific processes in nature. As Engelhard puts it,

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'laws are abstract entities, hence it seems impossible that they can act on concrete spatio-temporal things' (Engelhard 2018: 28; see also Watkins 2005: 406–7).

More recently, a promising approach to the problem of the necessity of empirical laws has been developed: the 'essentialist' account of laws. Despite important differences in the details of the various versions of this account, essentialists share the same tenet regarding the origin of necessitation of laws. They do not try to reduce necessity to a product of our cognitive faculties. Instead, they hold that the necessity of empirical laws is grounded in the essences or natures of things. Note that a supporter of the Best System account can hold that laws are grounded in essences provided that essences are defined by their membership in an optimal epistemic system. To clearly distinguish Best System readings from essentialist readings we need an additional claim: essences are not dependent on any feature of our cognizing them.[6] Call this *metaphysical essentiality*. More specifically, as we will see, laws are grounded in essences via the essential properties (or powers) belonging to them. On this view, to formulate a necessary law of nature 'is to identify a kind on whose nature some regularity depends' (Kreines 2008: 528). In more formal terms, the necessity of a certain effect F of some object x that belongs to kind K originates in the essence or nature of K. Since it is essential for K to bring about F, it is a law that, necessarily, all xs are Fs. For instance: necessarily, if something x is gold and it is essential for gold to be dissolved in aqua regia, all xs dissolve in aqua regia.

If this is correct, the essentialist account would entertain similarities with contemporary necessitarian views of laws (such as e.g. the views of Armstrong, Ellis or Bird).[7] But why is this account promising for the debate about Kant's own position? There are at least three reasons that I can mention here. First, this reading makes the case for a substantial continuity in Kant's view on laws from the critical to the pre-critical texts (e.g. in the *Only Possible Argument*), where Kant clearly endorsed an essentialist view on laws.[8] Second, this view has abundant textual support: although we do not find any systematic treatment of essences in his critical texts, Kant does maintain the 'language of essences' in the critical period (see Messina 2017) and the unpublished writings contain extensive and detailed remarks on them. Third, and most importantly, essentialism provides a convincing answer to the problem of the origin of the necessity of empirical laws. The necessity that results from this view is neither based on systematic regularities that may have no purchase on nature, nor is it derived from abstract laws that inexplicably act on specific natural processes. Rather, it is a kind of 'natural necessity', anchored in the essential properties of things as their metaphysical sources.[9]

In this article, I will not focus on the metaphysics underlying the claims that I have just briefly sketched (I will, however, add important details in section 5). I will rather investigate a major epistemic worry resulting from this broad position, whose solution would contribute to our understanding of the role of essences (if any) in empirical investigation. In fact, if the metaphysical side of the essentialist account may sound convincing, the epistemological side of this view turns out to be more problematic than it initially seems. Of course, even essentialists do not reduce Kant's position to traditional metaphysical realism. To say that the necessity of laws is grounded in the essences of things is obviously not the same as to say that we can know those laws. On the contrary, the essentialist account poses extensive limitations on our cognitive faculty, trying to preserve the necessity of empirical laws against an

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inflated account of knowledge. Paraphrasing a Kantian expression, essentialists need to deny knowledge of empirical laws to make room for their necessity.[10]

The most detailed account of our epistemic limits regarding empirical laws is the one proposed by Kreines (2008). According to his reconstruction, there are necessary laws, but we are prevented from knowing them. Knowledge of necessity requires a priori cognition, which in turn requires a priori intuition. As Kant says clearly in the *Metaphysical Foundations of Natural Science*, such a priori intuition is not available for 'determinate natural things' (*MFNS*, 4: 470). As a result, the necessity of their laws is not knowable by us.[11] The only exception is represented by the laws of mechanics since they concern a single kind (matter) that stands in close connection with our pure intuition of space (see Kreines 2008: 540–3).[12] The remaining infinite manifold of laws constitutes in its necessity an inaccessible realm for our knowledge, so that we can never be sure whether we have identified a law of nature instead of a mere regularity (see also Stang 2016: 258).

Except for the laws of mechanics, the essentialist account has therefore to deny the possibility of knowing empirical laws. Can we still obtain some form of cognition of laws in the essentialist story? For Kreines, reason's systematicity, that is the ideal of systematic unity through which we order and classify regularities, serves to 'think as laws the empirically known rules' (Kreines 2008: 537). The only reason we do so is that otherwise we would make 'no progress in our investigation of the particularities of nature' (Kreines 2008: 537). These rational sources do not change the modal status of the regularities we encounter in experience. Empirical enquiry can only 'approximate to knowledge of the sort of universality that it seeks' (Kreines 2008: 538). As I will argue in detail below, this solution opens new problems that essentialists do not fully acknowledge.[13] As noted by Breitenbach, if reason's systematicity is an unreachable ideal that never really brings us to laws of nature, it is doubtful that empirical cognition and empirical progress are possible at all (see Breitenbach 2018: 117). That is, it is unclear how simply regarding regularities as lawlike would help us acquire and improve cognition of laws.

The essentialist view identifies a plausible source of necessity for empirical laws at the cost of sacrificing their cognizability. Is there a way to maintain a grounded metaphysical necessitation of laws without undermining the very purposiveness of empirical enquiry, namely an enquiry in which empirical cognition of laws has its legitimate place?

3. Purposiveness of science: reconciling necessity and cognizability of empirical laws

Essentialists typically deny any kind of epistemic access to empirical laws and replace it with a mere assumption for the sake of progress in science. However well supported, this claim must be questioned, for it implicitly undermines the very purpose of scientific enquiry. On Kreines' account, the only empirical laws that we can know with necessity are the laws of mechanics because of their very special status (i.e. only in their case do we have a priori intuitions that complement our concepts). All other empirical laws are regarded as laws, but they remain strictly speaking mere regularities. It is fairly evident that the essentialist account has delivered less than expected. It is true that we have reached a clear understanding of the origin of

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necessity, but as regards our empirical enquiry and the basic presumption of necessity under which we can carry out the enquiry itself, we have not gone one single step further. What we have ended up with is a mere ensemble of regularities that are inexplicably said to approximate a kind of necessity that, however, lies beyond the boundaries of knowledge.

I submit that the nomological ignorance resulting from the essentialist position has the potential to lead to sceptical scenarios that essentialists fail to fully address. If we cannot have knowledge of empirical laws, it is unclear precisely why we should regard rules as laws and attempt to acquire cognition of laws. After all, a sceptic could maintain that, since we cannot know the essences in which particular laws are grounded, we also fail to track genuine lawful connections. Note here two important points. First, if the essentialist is right that essences are unknowable, it also seems correct to maintain that we cannot fully know particular laws. As a result, a reply to the sceptic cannot, I believe, appeal to knowledge of laws. Second, to say that we can still cognize regularities while remaining ignorant of laws is of little help here, for what Kant seems to take as the object of empirical investigation are necessary laws, not regularities depending on them (e.g. *CPR*, A127–8, A159/B198). To answer the sceptical challenge, an essentialist should make room for some form of cognition of laws of nature that, on the one hand, does not boil down to mere cognition of regularities, and, on the other, does not result in knowledge. Since, on this account, laws are grounded in essences, the essentialist should introduce a specific form of legitimate yet incomplete epistemic access to essences to offer a satisfactory answer to the sceptic.[14]

The sceptical challenge seems to jeopardize the possibility for human cognizers to acquire empirical cognition of laws and approximate to necessary laws. But I contend that Kant's account of reason and its ideas has internal resources to address this challenge. In the Dialectic, Kant isolates a positive doctrine that transforms reason's natural tendency towards metaphysics into an epistemic source for empirical investigation. In the following section, I briefly present a general account of reason's positive role in natural science. I then apply Kant's considerations to the problem of empirical laws of nature. More specifically, I suggest that ideas of reason allow us to think essences in which laws are grounded as limits of inquiry. Finally, I explain how we can acquire and improve cognition of laws.

4. The general role of the systematicity of reason in natural science

I wish to start my discussion with a preliminary account of the most general level at which reason, and in particular, reason's idea of systematicity, is relevant to the empirical investigation of nature. In the Appendix to the Transcendental Dialectic, Kant writes:

> Reason never relates directly to an object, but solely to the understanding and by means of it to reason's own empirical use, hence it does not create any concepts (of objects) but only orders them and gives them that unity which they can have in their greatest possible extension, i.e., *in relation to the totality of series* … Thus *reason really has as object only the understanding and its purposive application*. (*CPR*, A643–4/B671–2; emphases added)

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Reason's 'object' (in the broad sense) is the understanding itself, and reason finds its proper empirical use by applying itself to it. As Kant puts it, reason's function is not to create concepts of objects, but to guide the understanding and make its use 'purposive'. Since Kant is here referring to the empirical investigation of nature, reason serves to give a purpose or goal to the understanding's actions while investigating nature. But what is this purpose or goal? And what does it imply for the necessity of empirical laws of nature?

The epistemic goal that reason sets up for the understanding is the 'totality of series'. 'Totality of series' (or 'absolute totality of the series of conditions', see e.g. *CPR*, A327/B384) is a technical term that Kant presents and discusses in the course of the Dialectic. Roughly speaking, reason is not satisfied with the connections between particular conditions that the understanding has to do with (e.g. particular causes, spatial parts, contingent objects, etc.; see Willaschek 2018: 74). All such particular conditions are not satisfactory for reason because each of them, in turn, depends on further conditions – as such they fail to offer ultimate answers to our investigation. On Kant's account, reason thus naturally demands something that is ultimately explanatory and not itself conditioned: the unconditioned, or the absolute totality of conditions.

Kant spells out this epistemic goal in terms of systematicity or systematic unity of cognition. If we get to know the totality of conditions, the series of conditions connected by the understanding no longer constitutes a chaotic aggregate, but a unified system of cognitions in which the 'whole' precedes its 'parts' (*CPR*, A645/B673).[15] In fact, for Kant, systematic unity is what defines science proper or science in the strict sense (see *CPR*, A832/B860; *MFNS*, 4: 468), namely, a body of cognition that is not merely the result of induction but is apodictically certain and, as such, deserves the full title of 'knowledge'. A proper science is not a mere 'contingent aggregate' of regularities, but a 'system interconnected in accordance with necessary laws' (*CPR*, A645/B673). In other words, if reason's demand for the 'totality of conditions' is fulfilled, the connections among the various parts of the system would be complete and certain, i.e. they would amount to necessary laws. Note that this is not to say that necessary laws result from the systematization of our cognition. Rather, it is to say that the ideal realization of a complete science would describe the complete system of dependence relations among conditions.

But how can such a system form once we take into account the limitations of our cognition? As Kant argues in the Dialectic, the absolute totality of conditions lies beyond the possibility of experience and, as such, can never be cognized. Kant's argument hinges upon the constitutive limitation of cognition to 'empirically conditioned' conditions, or conditions that are given in space and time: 'with all possible perceptions, you always remain caught up among *conditions*, whether in space or in time, and you never get to the unconditioned' (*CPR*, A483/B511). Since we can only experience objects under the conditions of space and time, we can never obtain something that is absolutely independent of such conditions (see *CPR*, A494/B522). In other words, our spatiotemporal experience can never give us something like a view from nowhere on nature. While this limitation explains why we cannot get to unconditioned conditions, or conditions that abstract from the spatiotemporal conditions under which we necessarily experience objects, it is less clear what it implies when the totality of conditions is represented by an infinite series of

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empirical conditions (the infinite series of spatial parts or past moments of the world, for example). Even in this case, Kant argues, the totality of conditions remains beyond our cognitive capacities, for even if each particular condition forming the series can be perceived, their 'absolute whole' – as an *infinite* complete series – cannot be given to us in our limited experience (see *CPR*, A483–4/B511–12).[16]

If a systematic unity of cognition can never be achieved, it also follows that we are never able to obtain a complete corpus of knowledge 'interconnected in accordance with necessary laws' (*CPR*, A645/B673). So far, Kant's Dialectic seems to confirm the sceptical scenarios that result from the standard essentialist account of empirical laws. But there is more. For Kant, the same rational resources that lead us to postulate unreachable totalities of conditions acquire an epistemic value with respect to empirical investigation. Although we cannot claim knowledge of the absolute totality of conditions, the latter can be regarded as an *idea* that regulates the understanding and its acquisition of cognition:

> The absolute totality of the series of these conditions in the derivation of their members is an idea which of course can never come about fully in the empirical use of reason, but nevertheless serves as a rule for the way we ought to proceed in regard to them: namely that in the explanation of given appearances (in a regress or ascent), we ought to proceed *as if* the series were in itself infinite, i.e., proceed *in indefinitum*. (*CPR*, A685/B713)

As an idea of reason, the absolute totality of conditions has *prescriptive* value. Its function is to tell the understanding how we *ought* to proceed with respect to the series of conditions: namely, to always look for further empirical conditions and to never take the series as completely given in experience. Indeed, since such complete series of conditions cannot be given to us, Kant warns against using this idea to 'think the totality in the object as real'; rather, we should use it as 'a *problem* for the understanding, thus for the subject in initiating and continuing, in accordance with the completeness of the idea, the regress in the series of conditions for a given conditioned' (*CPR*, A508/B536). In other words, reason prescribes systematic unity (or the totality of conditions from which such a unity results) as the goal of the actions of the understanding. Such a goal, however, should not be used to ground true claims about real objects.[17]

The prescriptive value of ideas allows a preliminary reply to the sceptical challenge: what entitles us to regard rules as laws? or, more generally, to postulate that nature is systematic? The systematicity of nature seems to be an ad hoc assumption that we subjectively stipulate to justify our procedures. For example, we may stipulate that a well-embedded rule – e.g. that gold dissolves in aqua regia – is really a law of nature. But if we cannot obtain knowledge of laws, this seems indeed an arbitrary and unjustifiable stipulation. As prescriptively valid rules, ideas of reason do not face such an objection. Assuming systematic unity of nature is valid not because it sufficiently grounds knowledge of true laws of nature, but because it directs our understanding to systematize relations among given conditions and discover potentially lawful rules (such as, 'gold dissolves in aqua regia'). As a result, we ought to proceed in accordance with the ideas of reason, regardless of whether discovered regularities are indeed laws of nature. In other words, reason gives a

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'purpose' to empirical investigation by allowing us to look for systematic (and lawful) relations in nature.

This is not, however, a sufficient answer to the above-mentioned challenge.[18] It is still not clear what the systematic unity of reason entails for our search of empirical laws and what sense of empirical cognition it affords. Without enabling some form of cognition (or giving us some access to essences, to use the essentialist vocabulary), the prescriptive value of reason would not be particularly helpful – it would only prescribe us to constantly look for further systematic relations among regularities. A further argument is required to explain why such systematizing can provide us with cognition of necessary laws. We need to look more closely at how ideas of reason can be applied to essences, and what this implies for the cognizability of empirical laws of nature.

5. Real essences qua ideas of reason

I now wish to apply Kant's general points about reason and its ideas to the specific problem of the cognizability of empirical laws. Although Kant does not particularly elaborate on such application, he offers several clues in the Appendix and other texts that suggest that this is not only a plausible, but a key part of his doctrine of empirical investigation. I contend that, although essences cannot be known, they can be thought as 'ideas of reason' in Kant's technical sense of the term. As ideas of reason, essences direct our investigation of empirical laws of nature and provide us with a robust sense of empirical cognition.

As we saw, reason's idea of systematicity has prescriptive value. Properly speaking, reason's concepts, or ideas, are not concepts of objects – the absolute totality of conditions can never be given to us in experience and, therefore, we are not warranted to take them as concepts of real things. Ideas are rather to be used as prescriptive rules to guide our understanding:

> One cannot properly say that this idea is the concept of an object, but only that of the thoroughgoing unity of these concepts, insofar as the idea serves the understanding as a rule. Such concepts of reason are not created by nature, *rather we question nature according to these ideas, and we take our cognition to be defective as long as it is not adequate to them*. (*CPR*, A645/B673; emphases added)

In this and other passages, Kant emphasizes the a priori origin of ideas. Since no empirical object can be given to us that matches our rational concepts, ideas cannot be derived from experience. Rather, ideas are a priori concepts of reason according to which we first investigate nature. In other words, ideas are to be thought of as standards of empirical cognition: they allow us to assess the defectiveness of our cognition and tell us what we ought to approximate. Among the various ideal standards discussed in the Appendix, Kant includes ideas of particular elements and powers, such as 'pure earth', 'pure water', 'pure air' and 'fundamental power', to exemplify how reason proceeds towards the acquisition of a 'system interconnected in accordance with necessary laws' (*CPR*, A645/B673). In Kant's words:

> Admittedly, it is hard to find *pure earth*, *pure water*, *pure air*, etc. Nevertheless, concepts of them are required (though as far as their complete purity is

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> concerned, have their origin only in reason) in order appropriately to determine the share that each of these natural causes has in appearance; thus one reduces all materials to earths (mere weight, as it were), to salts and combustibles (as force) and finally to water and air as vehicles (machines, as it were, by means of which the aforementioned operate), in order to explain the chemical effects of materials in accordance with the idea of a mechanism. (*CPR*, A645–6/B673–4; see also A649/B677)

How would such ideas of elements contribute to the formation of a system of empirical laws? I argue that ideas of reason allow us to think essences, and more specifically 'real essences', as ideal limits of inquiry. I contend that although real essences cannot be known as objects (as totalities of essential properties), they play – *qua ideas* – a fundamental epistemic role in empirical investigation.[19] To substantiate these claims, I need to go back to Kant's treatment of essences in his lectures on logic and metaphysics.

As we saw, according to the broadly 'essentialist' account of laws presented in this article, the real necessity of empirical laws must be grounded in essences or natures of things that are beyond the boundaries of empirical cognition. Kant, however, distinguishes between the 'unknowable' real essence of an empirical object and its epistemically accessible logical essence. The logical essence of an empirical object is the 'subjective basic concept' of the thing (Log-Blomberg, 24: 116). It contains the predicates or marks that we use to distinguish the thing from all the others (Log, 9: 143). As such, the logical essence is changeable and incomplete. For example:

> The concept that water is a fluid element, without odor or taste, 14 times lighter than quicksilver, etc., is the logical essence of water [;] for if I have mastered physical cognitions about something, then I think of all this as soon as I mention the word water. From this, of course, I cannot at all derive all the remaining properties which are determined for water, and which belong to it or can belong to it, and perhaps are not yet all discovered, although we do not always think them in this connection [;] consequently it is not the real essence. (Log-Blomberg, 24: 118; see also Letter to Reinhold, 12 May 1789, *Corr*, 11: 36–7)

By contrast with the merely subjective logical essence, the real essence is defined by Kant as 'the first inner ground of all that belongs to the possibility of a thing' (Met-Mron, 29: 820).[20] This definition poses the following interpretative challenge. If the real essence of an instance x is the ground of everything belonging to the possibility of x, one may think that such ground is other than x itself (for example, God or some distinct entity). Following Stang, however, this does not seem to be the case – a clear counterexample being the fact that, for Kant, the real essence of matter includes the power of attraction.[21] To give Stang's definition of real essence:

> Where K is a kind (the appropriate target of a real definition) and *x* is a possible instance of that kind, the real essence of K is the complex of properties possessed by *x* that ground *x*'s being an instance of kind K. (Stang 2016: 235–6)

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According to this definition (well-supported by textual evidence),[22] the real essence of a sample of water, for example, is not something other than such a sample. It is rather the complex of properties possessed by this sample that makes it the case that it is a sample of water. The real essence of an instance x of a kind K can be expressed as follows:

$$\text{x possesses } [P1 + P2 + P3 + \ldots]$$

As we know, the real essence, and therefore the complex of properties that composes it, cannot be known. From the fact that the real essence cannot be known, however, it does not follow that this concept does not play any epistemic role. In fact, the logical essence can hardly represent a goal for scientific investigation. When investigating nature, we cannot be satisfied with subjective concepts that only allow us to distinguish a thing from the others. The goal of scientific investigation is rather to infer fundamental properties from the manifest ones, and therefore to approximate our logical essences to real essences. As Kant puts it:

> He who wants to find the real essence must be acquainted with all the marks that belong to the thing constantly. Then he must search further for the ground of these, and must endeavor to investigate them, and this is the real essence, then. (Log-Blomberg, 24: 118; see also Log-Wiener, 24: 916; Log-Dohna 24: 728)

I contend that we here find a particular case of reason's demand for the totality of conditions. Our questions about the grounds of empirical laws would be answered only if acquainted with all the properties that belong to the thing constantly (P1, P2, P3, etc.), but such acquaintance goes beyond the possibility of our experience.[23] To use a contemporary example, think about the property 'being composed of H_2O molecules'. One may argue that this property exhausts the essence of water. But I take Kant to hold that, since our empirical investigation of a kind proceeds indefinitely, we cannot regard this property or any discovered set of properties as a sufficient and non-revisable definition. It is at best a necessary part of what it is to be 'water'. The complex of (potentially infinite) properties thus represents the particular 'totality' or 'series' that reason attempts to complete:[24]

$$\text{totality of conditions: } [P1 + P2 + P3 + \ldots]$$

One may note a possible discrepancy between what I called 'metaphysical essentiality' and the thinkability of essences as ideas of reason. Recall that ideas of reason are not to be used as concepts of objects. But if no object in nature corresponds to essences, we seem to lose the very ground of laws of nature postulated by the essentialist. I think this would be a hasty conclusion. As we just saw, the real essence of a sample of a kind does not differ from the sample itself. It is therefore plausible to assume that, although essences cannot be known and can only be thought as ideas, all empirical properties composing them are themselves contained in the instances of kinds that are given to us (albeit in such a way that their totality escapes our epistemic access). In fact, Kant has a technical discussion of cases where a 'whole' is given in intuition with all its parts and it is only their 'whole division' that can never be fully attained (i.e. cases of decomposition; see Kant's resolution of the second antinomy,

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CPR, A524/B552). Although a satisfactory treatment of these cases is not possible here, I wish to briefly suggest that, while all essential properties grounding necessary laws are given with the instances of natural kinds, their totality can only be thought as an idea of reason. As a result, essences qua metaphysical grounds and essences qua ideas of reason are compatible if we distinguish between the way essences are instantiated as complex of empirical properties and the way we investigate them.

I can now fully apply the reconstruction of reason and its ideas in the previous section to the present case. Although the totality of properties that make up the real essence cannot be known, the idea of such totality serves as a rule for the empirical investigation of nature. As we saw, ideas prescribe us to look for further empirical conditions and to never take the series of conditions as completely given. I suggest that, in the case of ideas of particular essences, such as the ideas of chemical elements, reason tells the understanding to constantly search for and revise properties of empirical objects 'as if the series were in itself infinite' (*CPR*, A685/B713). In other words, real essences – qua ideas of complete series of properties – give direction to the empirical investigation of nature by providing standards that we attempt to approximate.

6. Epistemic access to comparatively inner properties

The suggested account of real essences should give us a better sense of what empirical cognition of laws amounts to. As we just saw, ideas of real essences are the prescriptive rules that allow us to constantly enrich the logical essences of empirical objects. But there is another, often neglected distinction that can help us clarify such constant enrichment, and thereby how we should go about acquiring and revising cognition of laws of nature: the distinction between absolutely and comparatively inner properties. This distinction has not been particularly highlighted in the literature, but as Warren (2001) has pointed out, it plays a more important role than generally acknowledged. Here I want to suggest that it plays a key role in understanding the kind of epistemic access we have to the essences that ground empirical laws.

I showed that the real essence is the complex of properties of an empirical object, and that such a complex is demanded by reason as the absolute totality of a given set of conditions. Now, although such an absolute whole is not an object of experience, Kant does allow for epistemic access to wholes of conditions as long as they are 'comparative' (rather than absolute), namely, if they represent empirical totalities, or totalities in comparison to particular conditions (see *CPR*, A483/B511). More to the point, Kant argues that essential properties can be cognized if they are 'comparatively internal' or 'inner' (e.g. *CPR*, A277/B333). As pointed out by Warren, Kant does not propose an 'unqualified rejection of the rationalist claim that we are able to characterize an object through its inner properties' (Warren 2001: 46). Rather, Kant argues that inner (i.e. essential) properties of objects can be cognized if they are given to us in experience, and therefore in terms of external relations: in Kant's words, 'I have therefore nothing that is *absolutely,* but only *comparatively* internal, which itself in turn consists of outer relations' (*CPR*, A277/B333; see also A285/B341). We find the same distinction applied to the concept of essence in the lectures on metaphysics. Although we cannot know the real essence completely, we can call something a real

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essence 'comparatively': a comparatively real essence is what human beings can undertake to show of a complete real essence 'through experience'.[25]

I argue that ideas of real essences are crucial to empirical cognition inasmuch as they give us epistemic access to comparatively inner properties (the properties that make up comparatively real essences). By acting as rules, they provide the standards according to which we infer comparatively fundamental properties from the manifest ones we encounter in experience, and progressively approximate the real essences of given appearances. Ideas play such a role in rational inferences because they demand us to look for ever more fundamental properties composing the essences of things. For one thing, Kant explicitly specifies that ideas of reason 'concern not merely the things, but even more the mere properties and powers of things' (*CPR*, A662/B690). For example, ideas of reason allow us to infer that the orbits of planets are elliptical (*CPR*, A662/B690). Moreover, the comparative/absolute distinction figures in the example Kant discusses most extensively in the Appendix, namely the idea of fundamental power – what I take to be the idea of the totality of conditions with respect to the various appearances of powers.[26] This idea does not provide us with knowledge of a fundamental power. However, it prescribes us not to be satisfied with the variety of powers we encounter in experience and to look instead for their fundamental unity:

> The more appearances of this power and that power are found to be identical, the more probable it becomes that they are nothing but various expressions of one and the same power, which can be called (comparatively) their *fundamental power*. One proceeds in just the same way with the rest of the powers. These comparatively fundamental powers must once again be compared with one another, so as to discover their unanimity and thereby bring them close to a single radical, i.e., absolutely fundamental, power. (*CPR*, A649/B677)

I take this passage to mean that the idea of fundamental power allows us to look for comparatively fundamental powers in experience. The idea does not tell us that a single absolutely fundamental power will be found but provides us with a precise and epistemically fruitful standard for the discovery and constant revision of empirical powers in nature. As a prescriptive rule, the idea demands to *look for* more fundamental powers belonging to the essence of a natural kind.[27]

If this reconstruction is correct, we can finally offer an answer to the sceptical challenge raised above, namely how we can make sense of empirical cognition of laws without being able to fully realize the ideal of systematicity of nature. Real essences should be regarded as ideas that allow us to get epistemic access to inner properties (or powers) that further our empirical cognition of essences. Crucially, comparatively inner properties (or powers) can figure in epistemically valuable empirical cognition. They can be part of cognition because they are themselves empirical or given to us under the conditions of space and time. But at the same time, they are more 'fundamental' than mere regularities because they are assumed and investigated in accordance with rational ideas.[28] In other words, the standards offered by reason allow us to look for what *conditions* the particulars that are given to us. Such conditions have, to use Warren's terminology, 'ontological' and 'epistemic' priority over the conditioned appearances we start with (Warren 2001: 51–2). Take comparatively fundamental power: such power has a clear ontological priority over

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the powers it unifies inasmuch as it conditions them (or produces them as effects) rather than being conditioned by them. As Kant puts it with respect to properties, although comparatively inner properties are only empirical relations, 'there are among these some self-sufficient and persistent ones, through which a determinate object is given to us' (*CPR*, A285/B341).

Ontologically prior conditions possess key epistemic priority (and value). For to cognize comparatively inner properties is a necessary condition to *explain* the conditioned particulars as their effects. As Kant puts it with respect to chemical ideas, we reduce different appearances to pure water, pure earth and pure air to 'explain the chemical effects of materials in accordance with the idea of a mechanism' (*CPR*, A646/B674). Kant is not saying – implausibly – that, for instance, the idea of pure water is in itself explanatory, or that we can use an idea to directly explain natural phenomena.[29] Rather, I take him to be saying that in accordance with such an idea, we can discover 'higher' empirical conditions (i.e. properties) that we can use to explain various appearances of water (*CPR*, A564/B592). More generally, ideas allow us to form hypotheses about empirical properties which, if true, would best explain the effects we see.

This reconstruction allows to take a middle way between the scepticism that seems to result from the essentialist account of laws and metaphysical knowledge of essences. Real essences should be regarded as mere ideas that do not afford us knowledge of them as objects. As rules, however, they allow us to infer comparatively inner properties (or powers) that, although empirically conditioned, are ontologically and epistemically more robust than mere regularities. Consequently, ideas play a crucial role in making our empirical cognition converge towards systematic unity, namely a 'system interconnected in accordance with necessary laws' (*CPR*, A645/B673). As such, this interpretation accommodates two apparently incompatible intuitions that underlie Kant's philosophy of nature, namely that we cannot know laws of nature, but that we can acquire and improve our cognition of them.

Let me conclude this section by briefly replying to two possible worries that my account of essences may give rise to. The first worry is that assigning such a leading role to ideas of reasons and systematicity in our investigation of laws of nature may turn my account into a variation on the Best System reading. Note, however, that while I take it to be true that, for Kant, systematic considerations are a guide to uncovering lawlike connections, it does not follow from this that laws are *dependent* on their being embedded in a system. Laws of nature are grounded in the properties of empirical objects, regardless of whether we think of their totalities as ideas guiding our investigation. But if systematic considerations do not constitute what is to be a law of nature, how does my account improve on the received essentialist story? It bears repeating that, while my view remains true to the ultimate unknowability of laws, it does offer a rationale for the empirical investigation of laws. For one thing, ideas of reason direct our investigation by giving inquirers the purpose to cognize the essences of things and the laws they ground. Second, we have legitimate epistemic access to essences by progressively cognizing their comparatively inner properties. That 'gold dissolves in aqua regia' is a genuine lawful connection grounded in comparatively intrinsic properties of the kind gold. Given the limitedness of our experience, such epistemic access is incomplete and fallible, but we can reasonably maintain, contra the sceptic, that we can improve our cognition of the laws grounded in the essence of a natural kind.

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7. Conclusion

I have argued that reading the problem of the necessity of empirical laws through the lens of the Dialectic allows us to make sense of cognition of empirical laws within the context of a broadly understood 'essentialist' account. Reason does not determine the necessity of empirical laws. Rather, it is the fundamental cognitive faculty that allows us to acquire and improve cognition of laws that are grounded in the essences of things. While this interpretation hopefully shows a promising way of reconciling the metaphysical and epistemological side of empirical laws of nature, it leaves important questions about such reconciliation still unanswered: how exactly can we regard essences as ideas while keeping them as ontologically grounding realities? Are essences noumenal or phenomenal? And how should we spell out the relation between matter and specific natural kinds? Unfortunately, these and other questions cannot be satisfactorily pursued here. Unpacking the details of the compatibility among essences, powers and ideas would however be a necessary step to understand Kant's account of laws of nature from an essentialist perspective.

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Notes

1 Following Kreines (2008). I borrow the labels from Messina (2017).

2 References to Kant's works use the standard Academy references, except for references to the first *Critique*, which use the standard A/B notation. English translations are drawn from the Cambridge edition of Kant's works, with some modifications by the author. Abbreviations are as follows: *CPR* = *Critique of Pure Reason* (Kant 1998), *Corr* = *Correspondence* (Kant 1999) *MFNS* = *Metaphysical Foundations of Natural Science* (Kant 2004), Log/Log-Blomberg/Log-Dohna/Log-Wiener = *Lectures on Logic* (Kant 1992), Met-Mron/Met-L2 = *Lectures on Metaphysics* (Kant 1997).

3 See Willaschek and Watkins (2020: 3195) for Kant's conception of knowledge (*Wissen*): knowledge 'is a kind of assent to a judgement that requires consciousness of a sufficient epistemic ground'.

4 Note that merely emphasizing the technical meaning of 'cognition' (*Erkenntnis*) in Kant is not by itself a solution to this challenge. Following Willaschek and Watkins (2020: 3195), cognitions are representations or 'conceptual determinations of a sensibly given object'. As a result, one can have cognition of something without knowing it, since the former does not require epistemic justification, let alone certainty (see Willaschek and Watkins 2020: 3204). Consider, however, the case of laws. One could maintain that laws, while unknowable, are still object of cognition. But such a simple solution would beg the question. For what we can conceptually determine in experience (i.e. cognize in its technical meaning) are only instances of regularities, not necessary laws.

5 For more extensive analyses, see e.g. Kreines (2008), Breitenbach (2018) and Engelhard (2018).

6 I want to thank an anonymous reviewer for pressing me to clarify this point.

7 As noted by Watkins (2005), Massimi (2017), Messina (2017) and Engelhard (2018). Unfortunately, I cannot elaborate on the contemporary relevance of Kant's view here.

8 See Massimi (2014) and Stang (2016).

9 See Massimi (2017: 159) and Watkins (2005: 394).

10 This characterization applies particularly to Kreines (2008), Stang (2016) and Messina (2017).

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11 Alternatively, one could say that we cannot know the necessity of laws because we lack sufficient epistemic ground, i.e. a priori cognition of essences.
12 In this article, I assume that Kreines (2008) is correct about the epistemic status of the laws of matter. I leave the discussion of the complications connected to this point to another occasion.
13 That the essentialist position gives rise to epistemic quandaries has been noted in the literature. Massimi (2017), Breitenbach (2018), Engelhard (2018) and Cooper (2023) offer illuminating perspectives on different aspects of such quandaries. While my reading shares similarities with these approaches, it differs from them in the way of identifying the problem or solving it (see next note).
14 My approach to the epistemic problem of essentialism differs from interpretations that have attempted to vindicate knowability of laws (Massimi 2017; Engelhard 2018; Cooper 2023). I agree with Breitenbach (2018) that we can only improve cognition of laws, albeit I offer a different account of how this is possible.
15 For an extensive discussion of the relation between 'whole' and 'parts' in natural processes (more specifically, with respect to the problem of biological individuality), see Wilks' article, 'The "Whole" Truth about Biological Individuals in Kant's Account of Living Nature', in this special issue.
16 See also Willaschek (2018) and Watkins (2019), especially ch. 10.
17 For a more extensive discussion of the prescriptive function of ideas in general, see Spagnesi (2022).
18 Contra the 'standard' essentialist view; cf. Kreines 2008: 536–7.
19 My reading benefits from McNulty's 'ideational' account (McNulty 2015). However, while we agree that ideas play a pivotal role in Kant's account of empirical laws of nature, I suggest that they do not play any direct causal role but rather allow us to get epistemic access to empirical laws.
20 How does this distinction relate to that between 'essence' and 'nature' in the *Metaphysical Foundations* (*MFNS*, 4: 467–8)? First, I take 'essence' here to stand for 'real essence' since Kant defines it there as 'the first inner principle of all that belongs the possibility of the thing'. Second, Kant defines 'nature' as 'the first inner principle of all that belongs to the existence of the thing'. As a result, things whose concepts do not imply existence (such as geometrical figures) have essences, but not natures. In the case of existing things, it can be argued that real essence and nature coincide since existence would itself result from the real essence (see Stang 2016: 240). Kant often uses these terms interchangeably (see e.g. Log-Wiener, 24: 839–40; Met-Mron, 29: 820–1; Met-L2, 28: 553).
21 See e.g. Log-Blomberg, 24: 117. For a related example, see Letter to Reinhold (12 May 1789), *Corr*, 11: 36–7.
22 Kant explicitly says that the totality of properties constitutes the essence of a thing (see e.g. Log-Wiener, 24: 919); and 'complex' of properties is a Kantian term (see e.g. Met-Mron, 29: 820). One may wonder if this definition is compatible with the idea that the real essence is a 'first inner ground'. Kant, however, equates these two definitions in several passages (see e.g. Log-Dohna, 24: 760; Log-Wiener, 24: 919–20; Met-Mron, 29: 820). I therefore agree with Stang (2016) that, for Kant, 'the first inner ground of all that belongs to the possibility of a thing' *is* the 'complex' of essential properties possessed by that thing. One way to elaborate on this identity is to say that 'ground' expresses the 'complex' as a unified whole.
23 Note that Kant uses the same chemical examples for both ideas and essences (e.g. water and earth); see, for instance, Log-Blomberg, 24: 118 and Letter to Reinhold (12 May 1789), *Corr*, 11: 36–7.
24 One may here object that such a totality is not technically a series but a complex of 'coordinated' properties (cf. A409/B436; A414/B441). I submit that, although different properties may not be serially 'subordinated' to one another, they still constitute a series of parts similarly to material parts composing a whole. Further, according to Kant, properties should be related to each other in such a way that they can all be derived from basic properties (e.g. Met-Mron, 29: 935–6). If that is correct, essences can be regarded as series after all.
25 See Met-Mron, 29: 821. This point resonates with several passages admitting fallible, incomplete cognizability of essences (see e.g. Log-Dohna, 24: 728; Log-Wiener, 24: 839).
26 It is true that the idea of fundamental power is the idea of a 'power', not of an 'essence'. However, I submit that real essences contain fundamental powers that, as grounds of effects, can themselves be thought as ideas.
27 I further explore the relation between ideas of reason and the search for powers in Spagnesi (2022) and Spagnesi (2023).
28 It has been argued that regularities fail to explain their instances (since regularities are nothing but the sum total of instances, and instances cannot explain themselves). According to the model I am

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suggesting, we use ideas to identify the correct ontology of powers whose relations are then expressed in laws that play a genuine explanatory role with respect to their instances.

29 Kant explicitly denies that ideas have direct explanatory roles with respect to appearances (see A772/B800).

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