

Laws in Biology and the Unity of Nature

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1. Introduction

Kant's philosophy of science is famous for putting the lawful unity of nature center-stage. Kant argues that all natural phenomena are law-governed. Any appearance of lawlessness is only the result of our ignorance, and this is true whether we consider the animate or inanimate world. Kant puts this point unambiguously at the start of the

Jäsche Logic:

Everything in nature, both in the lifeless and in the living world, takes place according to rules, although we are not always acquainted with these rules. – Water falls according to laws of gravity, and in the case of animals locomotion also takes place according to rules. The fish in the water, the bird in the air, move according to rules. The whole of nature in general is really nothing but a connection of appearances according to rules; and there is no absence of rules anywhere. If we believe we have found such a thing, then in this case we can only say that we are not acquainted with the rules. (*JL* 9:11)

Kant here uses “rules” in the place of “laws,” but his central claim is clear. There is no exception to the law-governed character of natural phenomena. Kant develops this

¹ Kant sometimes employs the term “rules” (*Regeln*) more specifically to designate a priori principles of the understanding and “laws” (*Gesetze*) to refer to empirical laws of nature, e.g., at A645/B673. In other passages, however, he uses the terms interchangeably, e.g., at

claim in the *Critique of Pure Reason* where he sets out the fundamental laws of nature in general including, for example, the principle that every event has a cause. In the *Metaphysical Foundations of Natural Science*, he furthermore presents the laws of specifically material nature such as the rule that every change of motion requires an external cause. The arguments Kant develops for the universal reach of these laws in the first *Critique* and the *Metaphysical Foundations* are complicated but the basic idea is well known. The necessity these laws express is not given independently in things in themselves but is grounded in principles of the human intellect. It is human understanding that prescribes these laws to nature, and this is why we can know a priori that all of nature in general is unified by causal laws and all corporeal nature by the laws of motion.

Kant is also concerned to account for the more specific, empirical laws of nature, such as Newton's law of universal gravitation, Bernoulli's principle of fluid dynamics, or Hauksbee's law of gases. He elaborates on this dimension of the lawful unity of nature in the Appendix to the Transcendental Dialectic, the introductions to the *Critique of Judgment*, and the logic lectures. On Kant's account, the necessary form of empirical laws is grounded in the a priori principles of understanding, but cognition of their empirical content requires reflecting on the specificities of individual phenomena.² Kant recognizes that such reflection consists in comparing and contrasting particulars, following methods of induction and analogy, and that such empirical research presupposes the use of reason and its regulative idea of systematic

A646f./B674f. See also A189ff./B234ff. For the purposes of this chapter, I shall treat the two terms as equivalent.

² I argue for this reading of Kant's conception of empirical laws in Breitenbach (forthcoming).

unity.³ More specifically, Kant argues that in searching for empirical laws we must assume that our cognitions of the diversity of natural phenomena can be organized under systematically related concepts and principles. We must presuppose that all particular cognitions, no matter how seemingly unrelated, can be understood as part of “a system connected according to necessary laws” (A646/B676).⁴ As Kant argues further, this regulative idea of the unity of all cognitions, or the unity of science, presupposes an idea of the unity of the objects of such cognitions, or the unity of nature.⁵ In our search for particular laws we must assume that nature is such that it can indeed be explained by a unified science. We must regard nature as itself a system of law-governed phenomena hierarchically ordered into lower-level “species” and higher-order “genera” (A651f./B679f.).

The lawful unity of nature thus lies at the center of Kant’s philosophy of science. We can know it as constituted by the fundamental a priori laws that determine the universal character of all natural phenomena. And we must furthermore think it as ordered into a hierarchy of kinds and governed by systematically interrelated empirical laws.⁶

A second feature for which Kant’s philosophy of science is known is the specific diversity and autonomy Kant grants the individual sciences. In particular, he holds, there is an important difference between the study of physical and biological

³ See, e.g., the discussion at *JL* 9:132f.

⁴ The nature and viability of this presupposition is addressed, with different conclusions, in the chapters included in Part II of this volume.

⁵ Kant also presents this move from the principle of the unity of science to that of the unity of nature as the move from a logical to a transcendental principle. See A648ff./B676ff.

⁶ Kant accordingly distinguishes these two conceptions of unity as the (constitutive) “distributive unity” of the understanding and the (regulative) “collective unity” of reason (A644/B672). I assume both when I refer to the unity of nature in this chapter.

processes. Kant is acquainted with the work of the early German biologists, including Johann Friedrich Blumenbach and his students. Kant is aware of their experiments with polyps studying the regeneration of amputated parts.⁷ Against this background, he rejects mechanistic accounts of organic nature, denying that organisms are explicable merely according to mechanical laws. In the *Critique of Judgment* he draws the famous and equally remarkable conclusion:

It is quite certain that we cannot adequately come to know the organized beings and their internal possibility in accordance with merely mechanical principles of nature, let alone explain them; and indeed this is so certain that we can boldly say that it would be absurd for humans even to make such an attempt or to hope that there may yet arise a Newton who will make comprehensible even the generation of a blade of grass according to natural laws that no intention has ordered; rather, we must absolutely deny this insight to human beings.

(*CJ* 5:400)

Kant suggests that the progress made in physics by Newton's formulation of the laws of motion could never be achieved by the discovery of equivalent laws in biology. Organisms, he argues, cannot be explained by the laws of matter but must instead be judged according to a regulative maxim of purposiveness. Biological entities are special, on this account, since they require consideration under teleological principles.

Kant thus argues, on the one hand, for the systematic and law-governed unity of nature, and, on the other, for the autonomy and mutual irreducibility of the concepts that characterize the domain of different sciences such as physics and

⁷ See, e.g., *CJ* §§80–81.

biology. A key question this raises is how these two claims go together. If organisms cannot be explained according to the laws that unify all material natural phenomena, then what are the implications for Kant's conception of the lawful unity of nature? Should we reconceive this unity in light of Kant's philosophy of biology?

A number of commentators have recently concluded that Kant's teleological conception of biological entities and processes poses a challenge to the idea that organisms form part of the lawful unity of nature. They have argued that the only way to avoid the disunity of nature, for Kant, is to deny that biological entities are strictly speaking part of nature. On these accounts, since the principles particular to our conception of organisms are purely regulative, they are unable to permit knowledge of biological phenomena, let alone of biological laws.⁸

By contrast with these views, my aim in this chapter is to show that Kant's teleological construal of the organism is compatible with a naturalistic conception of biological entities and, in particular, leaves room for the discovery of genuine biological laws. Rather than taking organisms out of nature, I argue that Kant's teleological conception is a means for reflecting on parts of nature as organic, thereby picking out natural phenomena to be studied by the biologist. Moreover, I suggest that, on Kant's account, construing organisms according to teleological principles

⁸ According to [Zammito 2012](#): 123, it remains “a philosophical conundrum” for Kant how organisms can be “integrated into a unified system of empirical laws as the ‘order of nature.’” Similarly, Richards 2000: 26 concludes that Kant's *Critique of Judgment* “delivered up a profound indictment of any biological discipline attempting to become a science.” See also [Beiser 2006](#). I agree with these authors that Kant's teleological conception of organisms precludes an endorsement of Blumenbach's *Bildungstrieb* as an empirical teleological principle, thus shedding doubt on [Lenoir's 1980](#) claim that Kant's conception of teleology significantly shaped the evolution of the life sciences in the late eighteenth and early nineteenth centuries. I disagree with the further claim, however, that for Kant “biology could never be a science at all” ([Zammito 2012](#): 122).

does not threaten but, instead, sheds important light on the unity of nature. Kant's notion of natural teleology, I argue, offers a model for thinking about the unity of nature in a way the supposedly paradigmatic examples of the physical sciences do not.

To develop these claims, I begin by setting out my reading of Kant's teleological conception of the organism. I suggest that this conception is grounded in an analogy with the end-directed causality with which we are familiar from our own reason ([Section 12.2](#)). I then show that this reading leaves room for the possibility that organic phenomena are governed by fully naturalistic biological laws and form part of the systematic order of nature ([Section 12.3](#)). I argue, furthermore, that the possibility of naturalistic laws in the life sciences leaves the lawful unity of nature intact without eliminating the need for a teleological construal of the organism. However far the biological sciences progress, teleological principles remain indispensable and inform our search for a unified conception of nature ([Section 12.4](#)). The two aspects for which Kant's philosophy of science is famous should thus be understood in conjunction. Kant's idea of the unity of nature leaves room for, and indeed requires, a diversity of mutually irreducible concepts and laws ([Section 12.5](#)).

2. Organisms as Natural Purposes

Organisms appear to pose a problem for the lawful unity of nature on Kant's account. As Kant argues, they are contingent according to the laws of matter. In the "Critique of Teleological Judgment," he maintains that "nature, considered as a mere mechanism, could have formed itself in a thousand different ways without hitting precisely upon the unity" we find in organisms (*CJ* 5:360). Kant elucidates the characteristic unity of organic beings, which accounts for their mechanical

inexplicability, in three important steps. First, he argues that mechanical laws not only underdetermine the specific unity of particular organisms but that these laws are in principle incapable of accounting for the form and functioning that distinguish organic from inorganic nature. Second, Kant maintains that we can make sense of the distinguishing features of organisms only according to teleological principles. To conceive of organisms as lawful, we must regard them according to principles of purposiveness. However, as Kant claims in a third point, teleological considerations are not explanatory. They have analogical status and function only as a regulative guide in the search for explanations. Teleological laws characterize our reflection on organisms, but they are not constitutive of nature itself. To shed light on this teleological conception of organic beings, I consider these claims in further detail below.

First, Kant recognizes with Blumenbach that organisms have not only a special organization but also a capacity for self-organization. The form and functioning of the organism's parts depend on the form and functioning of the organism as a whole. Moreover, the maintenance of the whole is in turn ensured by the way in which the parts bring about and sustain each other. The structure and movement of the bird's wings, for example, are determined by the placement of the wings within the animal body and by their functional contribution to the bird's capacity to fly. At the same time, the movement of the wings is dependent on nutrition received from blood circulating through the animal body, a system that also has the function of maintaining the body's health and regenerating damaged organs. Organisms, as Kant argues, are not like machines but are internally self-organizing and striving for their

own existence and survival. As he concludes, “an organized product of nature is that in which everything is an end and reciprocally a means as well” (*CJ* 5:376).

Organisms thus construed are contingent in a strong sense. Their contingency is not exhausted by their being underdetermined by actual conditions in combination with the laws of matter. With respect to such underdetermination, organisms are no different from any other empirical phenomena, for on Kant’s account the particularity of individual phenomena is never exhaustively explained by general laws. As Kant argues, however, organisms are contingent in a special sense, since mechanical laws cannot even in principle explain the species of organization and self-organization characteristic of plants and animals. According to the laws of matter, material wholes are functions of their parts and of the way in which those parts interact and form into wholes. But reducing an organic whole to its parts and to their mechanical interaction can never explain the dependence of parts on the whole and their characteristic interdependence within the whole.⁹ Actual conditions together with the laws of matter are thus incapable of accounting even for the general outlines of the form and functioning of organisms.

The only way to make sense of organic beings as law-governed, Kant therefore argues in a second step, is to think of them as the products of purposive activity and as themselves exhibiting goal-directedness. As he puts it, “the concept of the combinations and forms of nature in accordance with ends is still at least one more principle for bringing its appearances under rules where the laws of causality about the mere mechanism of nature do not suffice” (*CJ* 5:360). Once we construe the organism as purposive, we can see the form and functioning of its parts as law-

⁹ For a detailed account of the mechanical inexplicability of organisms in Kant, see Breitenbach 2006; cf. [McLaughlin 1990](#): 152ff. and [Ginsborg 2015](#): 281ff.

governed. We can regard them as standing under teleological laws, that is, under rules for the realization of a purpose, in this case, the organism.

Consider, for example, the inner working of the bird's body. According to teleological principles, it is governed by such rules as "in order to maintain the proper functioning of the wings, the limbs must receive nutrition through the blood," or "for the purpose of maintaining blood flow, the heart must perform a steady pumping function." If we thus think of an intention as having arranged the parts so as to bring about the whole, and if we regard the working of the parts as means for bringing about the proper functioning of the whole, we can recognize organic beings as law-governed.¹⁰ Their lawfulness does not consist in their being necessitated by the laws of matter. Instead, it is constituted by their being necessitated by practical rules whose employment is a means for the realization of an end. It is this purposiveness of organic beings that Kant calls the "lawfulness of the contingent" (*CJ* 5:404). And since organisms are part of nature, he characterizes them as "natural purposes" (*CJ* 5:361). The reason why organisms are not explicable in mechanical terms, on this reading, is that we always, implicitly, regard them as natural purposes whose form and functioning is teleologically and not mechanistically structured. And in order to make sense of such a purposive unity, we therefore have to regard it, explicitly, as governed by teleological principles.¹¹

At this juncture it is important to bear in mind that, for Kant, purposes are essentially tied to intentionality and rational agency. On Kant's account, a purpose is

¹⁰ Kant thus presupposes a general conception of law that covers both theoretical and practical principles. See [Watkins 2014a](#) and Chapter 1 in this volume.

¹¹ In Breitenbach 2014 I have argued that the implicit and explicit employments of teleological principles are the two functions of teleological judgment.

the aim of goal-directed activity. At times, Kant defines purposes as the *realized* ends of intentional activity, as “that the concept of which can be regarded as the ground of the possibility of the object itself” (*CJ* 5:227). At other times, he characterizes purposes as the *conceived* aims of goal-directed activity, as “the concept of an object insofar as it at the same time contains the ground of the reality of this object” (*CJ* 5:180). Since, as I have suggested, Kant’s organic analogy involves the purposive organization of a realized end as well as the self-organizing activity of acting for a conceived end, both notions are implied in Kant’s conception of natural purposes. Most important, and more generally, purposes “have a direct relationship to reason” (*TP* 8:182), and the capacity to set ends can therefore be found only in rational beings. However, Kant is also convinced that nonhuman nature, including nonhuman organisms, is essentially nonrational and that by implication nonhuman nature has no intentions. This leads him to the difficulty of having to account for the apparent “contradiction” in the very notion of a “natural purpose” (*CJ* 5:370).

Kant resolves the tension by arguing, in a third step, that we do not cognize or experience organic nature as purposive in the ordinary sense, but rather “project” (*CJ* 5:360) the concept of a purpose onto nature. The concept, he suggests, has a purely regulative function. As a nonnatural concept, it guides our thinking about and our inquiry into biological entities and processes, even though it cannot feature in any determining judgments about such entities or processes. More specifically, Kant suggests that our judgments about organisms as natural purposes have analogical form. In considering organisms as natural purposes we regard them “in accordance with a remote analogy with our own causality in accordance with ends” (*CJ* 5:375).

This “remote analogy” does not consist, as a common reading has it, in the relation between organism and artifact.¹² For, as Kant points out, artifacts are in important respects distinct from organisms. Most important, artifacts do not display the capacity for self-organization that Kant regards as a key feature of organic beings. Kant’s remote analogy is rather that “with our own causality in accordance with ends,” that is, with the intentional activity that is productive of artifacts and, in particular, with the intentional activity of reason itself. According to this analogy, we consider the parts of an organism as if they were arranged so as to perform a function within the whole, and we regard organisms as themselves containing the principle for the proper arrangement and functioning of their parts.

The teleological analogy thus identifies the way we reflect on organisms and their striving activity with the relations between reason and the purposive actions of reason. More precisely, the analogy concerns two sets of relations.¹³ First, it identifies the relation between organisms and their striving activity with the relation between reason and its goal-directed actions. Second, it identifies the relation between organisms and their parts with the relation between reason as a whole and different rational capacities. In other words, the teleological analogy suggests that organic beings are purposively directed toward their own ends just as we set ourselves ends and strive for their realization. And it indicates furthermore that, just as our rational

¹² For the common reading, see, e.g., [McLaughlin 1990](#): 37ff. and [Guyer 2005](#): 352ff. [Ginsborg 2015](#): 281ff. points out the difficulties with the artifact analogy, but argues that the difference between organism and artifact is not important for understanding the teleological character of living beings. For a detailed discussion of Kant’s analogy, see [Breitenbach 2009a](#): chapters 3 and 4.

¹³ Kant characterizes analogies as postulating the identity of two relations, that is, as presenting not “an incomplete similarity between two things, but rather a complete similarity between two relations of wholly dissimilar things” (*Pröl* 4:357; see also A179/B222).

activities are purposively related to realizing and maintaining our rational agency, so the working of the parts of an organism is purposively related to ensuring the existence and survival of the organism as a whole. In regarding organic beings as natural purposes, we thus implicitly reflect on them by means of this two-fold analogy with the capacity for end-directed causality with which we are familiar from our own reason.

In response to the problem that organisms seem to pose for the lawful unity of nature, Kant has thus put forward a teleological account. Although organic beings, construed as natural purposes, are inexplicable by the laws of matter, they are lawful if construed in accordance with teleological principles. As Kant is keen to stress, this teleological construal has regulative status; it can guide analogical reflection on organic nature, but it cannot ground objective cognition of organisms.

Kant's answer to the problem organisms seem to pose now raises our original questions with new urgency. Recall that we were concerned to understand how the supposedly contingent organic phenomena could form part of the law-governed unity of nature. If Kant's solution to this problem relies on an analogical conception of organic beings, however, how can it ground cognition of the laws that govern those beings? Moreover, if organisms are construed as lawful merely by analogy, how does Kant's account solve the problem of biological entities seeming to lie outside the unity of nature? I put forward an answer to these questions in the next section.

3. Laws in Biology

We can begin answering the problem of biological laws by appreciating how Kant's analogical conception of the organism relates natural phenomena to a nonnatural idea. On the reading I propose, the analogy with rational purposiveness does not offer

grounds for any constitutive claims about organisms, but it makes possible reflection on, and identification of, particular natural phenomena. The important implication of this is that the analogy can guide research into the phenomena thus identified and, specifically, into the laws that govern these phenomena. The answer I propose in this section is thus that Kant's teleological conception leaves room for a naturalistic account of biological laws, which situates biological entities within the systematic order of nature.

As we have seen, it is an important feature of Kant's teleological analogy that it cannot lead us to determinately apply the concept of purposiveness to organic phenomena. As Kant puts it, what is transferred from one side of the analogy to the other is only "the form of the reflection, not the content" (*CJ* 5:351). In other words, we reflect on organisms as if they have the internal structure and directedness of rational purposiveness, yet we do not thereby assert that a principle of reason is active in nature. However, analogical reflection of this kind nevertheless guides the formation of concepts and principles that do determine organic phenomena. One way to understand this guiding function is to see that, in thinking about organisms by analogy with the intentional activity of reason, the nonnatural idea of such an activity provides an analogue for the missing empirical concept. As Kant argues, teleological analogies come into play because the laws of mechanical causality are insufficient for subsuming the experienced organic phenomena under "rules" (*CJ* 5:360). In the absence of a suitable naturalistic concept, the super-sensible idea of purposiveness guides the way we pick out natural phenomena as unified objects, which can also be understood in naturalistic terms and in accordance with the laws of nature.¹⁴

¹⁴ In line with this, Kant draws a parallel between schematism and analogical presentations as performing analogous functions (see *CJ* 5:351).

What this entails, more concretely, is that, by means of the teleological analogy, we reflect on different spatial and temporal parts of the organism as belonging to one unified being. For example, we regard the rabbit's nose, teeth, and intestines as related to the organism as a whole just as means are related to an end. Moreover, we reflect on the animal's acute sense of smell when it detects some but not other weeds as edible, and the complex working of the animal's intestines when they digest these weeds, as functioning for the purpose of the animal's survival. In judging natural entities and processes in this way, we thus regard them as unified by the idea of an organized and self-organizing whole. It is in this sense that the analogical reflection presents a condition for identifying organic beings and picking them out from their environments. In considering the rabbit, by analogy, as standing under teleological laws, we are not taking the organism out of nature, judging it to be something nonnatural. Instead, we are using a nonnatural idea to guide reflection on a natural phenomenon. The important insight of this Kantian proposal is that judging organisms in this teleological manner is a means for reflecting on parts of nature as unified natural bodies.

An implication of this is that the natural phenomena thus picked out can in principle be studied also in naturalistic terms. Indeed, if organisms are to count as natural beings "one is required to pursue [naturalistic explanation in causal-mechanical terms] as far as one can" (*CJ* 5:388). As Kant puts it,

the mere teleological ground of such a being is ... inadequate for considering and judging it as a product of nature unless the mechanism of the latter is associated with the former, as if it were the

tool of an intentionally acting cause to whose ends nature is subordinated, even in its mechanical laws. (*CJ* 5:422)

Kant's teleological account of organisms thus requires that the parts of nature identified by means of the teleological analogy stand under the universal laws of matter. Even though these laws by themselves do not explain organisms as natural purposes, they nevertheless govern the parts of nature on which we reflect by means of the analogy. By asking for the purpose of a biological trait, for example, we can thus direct our attention to the causal-mechanical processes that determine the trait's causal role within the organic body. The teleological analogy can thus guide research into natural processes to be explained by mechanical laws.

One may wonder, of course, whether the laws of nature to be discovered in this way are restricted to the physical-mechanical laws. Or does Kant's teleological account of organic nature leave room for specifically biological laws beyond the universal laws of matter? Turning, for a moment, to the more recent literature, it is interesting to see that philosophers of science have raised a parallel question about the possibility of laws in the life sciences today. In response to this question, several authors have suggested that the only laws that exist in biology are physical and, perhaps, chemical laws.¹⁵ Their reasons have been various, but high among them is the view that natural evolution is a process full of contingency and that, for this reason, neither the process nor the entities it produces are characterized by necessity relations. According to this view, no distinctly biological laws are there to be discovered. Or, in other words, the only laws to be discovered would not account for the specific contingency and exceptional character of organic nature. Such laws would

¹⁵ E.g., [Rosenberg 1994](#) and [Beatty 1995](#). For critical replies, see [Sober 1997](#) and [Mitchell 2000](#).

not be specifically biological laws. Instead, they would be concerned with the exceptionless regularities of physical or chemical processes.

A similar problem may also be raised for Kant. As I have argued, Kant's teleological conception of organisms makes room for research into non-teleological laws. But once we turn our focus on the natural phenomena picked out by means of the teleological analogy, and consider these phenomena independently of any teleological principles, we should not expect to discover laws that explain the characteristic organic properties we ordinarily regard in teleological terms. It thus seems that explanations by means of entirely naturalistic laws would not so much explain, but rather explain away, distinctively organic features.

Initial appearances to the contrary, however, I believe that Kant's account leaves room for the possibility of biological laws. Such laws would have to fulfill two desiderata. First, in order to be genuine laws of nature, they would have to be thoroughly naturalistic; that is, they would have to make use exclusively of concepts that determinately apply to natural phenomena. They would have to employ causal, non-teleological concepts. Second, in order to qualify as specifically biological laws, they would have to employ some specifically biological concepts. Such concepts would have to be suitably naturalistic, too. They would present naturalistic counterparts, for example, to the teleological notion of an organism or the related teleological concepts of a species or eco-system that we find in Kant.¹⁶

Consider, for example, recent attempts in the philosophy of biology to define the concept of an organism. There is little agreement among contemporary biologists and philosophers of biology about which organism concept to employ, with proposals

¹⁶ For Kant's teleological discussion of species and races, see his *ODR*, *HR*, and *TP*. For his discussion of what today we call "eco-systems," see *CJ* §§63 and 82.

invoking, for example, such diverse criteria as spatial boundaries, life-cycles, genetics, fitness maximization, or metabolic autonomy.¹⁷ All parties to the disagreement, however, share the conviction that the concept of the organism can be cashed out in naturalistic terms. In particular, and important for our case, there is growing agreement that the organism concept has to be regarded as basic and irreducible for the purpose of certain inquiries. It has been suggested, for example, that we cannot understand evolutionary processes unless we focus on the organism, and not only the gene, as a fundamental explanatory concept. And it has been argued, in a similar vein, that understanding how molecular parts interact is dependent on understanding how they are organized in a system, where the organism is recognized as a key level of organization.¹⁸ In biology and the philosophy of biology, we thus have no scarcity of candidate concepts that are entirely naturalistic and, at the same time, regarded as basic for certain parts of biological inquiry. It is concepts such as these, I suggest, that would feature in genuine biological laws and explanations by means of these laws.

Kant is not, of course, aware of any such concepts nor of any biological laws that employ these concepts. And yet he is careful enough to remind us that we cannot determine in advance the limits of naturalistic explanations.¹⁹ His account thus leaves room for the possibility of examining the specific properties of the natural phenomena picked out as organisms, and of classifying them and generalizing over them. We can, for example, examine the traits of their organs and the relations between their parts, and find out that rabbits have an excellent sense of smell and that their digestion

¹⁷ [Clarke 2013](#): 415 counts fifteen different proposals. See also [Clarke 2010](#) and [Wilson and Barker 2013](#). Similar disagreement surrounds the species concept. See, e.g., [Ereshefski 2001](#) and [Okasha 2002](#). On the eco-system concept, see [Sterelny 2001](#).

¹⁸ See [Nicholson 2014](#) and [Walsh 2015](#).

¹⁹ See *Cj* 5:388 and 418.

works by hindgut fermentation.²⁰ We can distinguish between rabbits and hares and discover that they have common ancestors and belong to the taxonomic order of Lagomorpha. We can formulate higher-level generalizations such as Mendel's law in order to explain the process of inheritance in rabbits and other animals. In asking about the purpose of a particular trait, we can thus inquire into its causal function within the animal system or its contribution to the evolutionary advantage of the organism's ancestors. In this way, we can research into the features that characterize the natural phenomena we have picked out as organisms and the associated laws that govern them.²¹

Kant's account is thus compatible with the possibility that genuine biological laws may be discovered by future scientists. To be sure, such laws could never explain the teleological character of organisms as natural purposes. Instead, they would explain the entirely natural, and hence causal, properties of those parts of nature on which we ordinarily reflect by means of the teleological analogy. In doing so, moreover, they may go some way toward explaining why biological entities and

²⁰ Hindgut fermentation is the fascinating process by which the digestive organs ferment hard plant tissues that the animal would otherwise be unable to digest.

²¹ In Breitenbach 2009b, I have furthermore argued that Kant's teleological conception is compatible with the discovery of causal relations that may consist, for example, in the natural selection of a particular trait, according to evolutionary explanations, or in the trait's nonlinear causal contribution to a system, in accordance with systems theory. Since neither of these theoretical accounts alleviates the need for teleological reflection, I have argued that neither offers what would be required of the Newton of the grass blade that Kant deemed impossible. In this I agree with a conclusion reached by Cohen (forthcoming). I think it is also important to recognize, however, that Kant's account leaves room for explanation in terms of biological laws even though such explanation can never ultimately dispose of the need for teleology.

processes appear to us as suitable for reflections in accordance with the teleological analogy.

Organisms construed naturalistically in this way do not pose any challenge to the lawful unity of nature. They do not threaten unity under the fundamental a priori laws and, in particular, offer no counterexample to the universal reach of the laws of matter. Nor are organisms thus construed at odds with ambitions for a systematic understanding of nature according to specific empirical laws. For it is in principle possible to spell out how the naturalistic biological concepts on which such laws rely relate to higher-order chemical and physical concepts and how the biological laws are in turn systematically related to chemical and physical ones. Organisms thus construed naturalistically are determined, just as other natural phenomena are, by specific laws – in this case, biological laws – and can be shown to be part of the systematic unity of empirical nature.

And yet this conclusion raises the question of whether the teleological perspective can eventually be eliminated from biology. As I set out in the previous section, Kant argues that organisms are contingent according to the causal-mechanistic laws of matter. Does the possibility of fully naturalistic concepts and laws in biology imply that we must give up on Kant's contingency claim? Can Kant's analogical conception of organisms as natural purposes eventually be reduced to the non-teleological conceptions just considered? These are the questions I turn to next.

4. The Organic Unity of Nature

Kant makes a strong claim in response to the question of whether we might, in the end, replace the teleological account of organisms with exclusively naturalistic

concepts. He maintains that however far we proceed in our causal explanations, any such explanation would nevertheless require subordination under teleological laws. As he puts it, any mechanical explanation of organic beings would “always be subordinated to a teleological principle as well” (*CJ* 5:417).

One way to begin making sense of Kant’s thought is to see that teleological reflection characterizes the way in which we ordinarily make sense of the world. It constitutes our pre-scientific, everyday understanding of nature. In other words, we cannot give up reflecting on nature according to teleological principles, since such reflection fundamentally characterizes what it means for us to live in a world that is, at least in part, alive. By projecting thoughts that we associate with our own rational purposiveness onto natural phenomena, we reflect on those phenomena in a way that would not be possible without the teleological analogy. By means of this analogical reflection, we first make sense of parts of nature as organisms.²²

The fact that, as Kant suggests, we are the kinds of creatures that construe the world as consisting of organic and inorganic things, does not of course tell us why we do so or whether we might not learn to do otherwise. And it may simply be the case that as a matter of fact we are wired so as to pick out organisms among other natural phenomena. Against this claim to philosophical bedrock, however, I believe that a longer and more comprehensive story can be told on Kant’s behalf. The details of the story are not always made fully explicit by Kant and can only be hinted at here. The key idea can be garnered from his writings on teleology and from the overall project of a “critique of judgment as a means for combining” (*CJ* 5:176) theoretical with practical philosophy and as “the mediating concept between the concepts of nature

²² I develop this answer in more detail in Breitenbach 2008.

and the concept of freedom” (C7 5:196). According to this idea, the necessity to construe nature in teleological terms is ultimately grounded in our need to understand the relation between reason and nature. More specifically, however far we proceed in replacing teleological considerations with causal-mechanistic explanations in biology, we cannot but think of ourselves in teleological terms, as acting intentionally and aiming at ends. Understanding ourselves as beings that act for purposes and realize ends in the natural world, moreover, in turn requires reflecting on nature, including organic nature, in accordance with teleological principles. On Kant’s account, I thus suggest, the need to understand ourselves as rational agents in the natural world makes the teleological conception of nature indispensable to us.

To shed some light on this proposal, imagine the biologist’s attempt to replace any teleological conception of organic nature with naturalistic concepts and principles. Reducing teleological reflection to causal explanations in this way would make it apparent that the conception of organisms as natural purposes, with which we started, was merely an analogical projection. It would show that our teleological reflections on organic nature make a claim not about the biological phenomena but only about ourselves. As Kant puts it,

The concept of a thing as in itself a natural purpose is therefore not a constitutive concept of the understanding or of reason, but it can still be a regulative concept for the reflecting power of judgment, for guiding research into objects of this kind ... ; not, of course, for the sake of the cognition [Kenntnis] of nature or of its original ground, but rather of the very same practical faculty of reason in us in analogy with

which we consider the cause of that purposiveness. (*CJ* 5:375; my translation)

Kant argues that teleological reflection does not give us determinate insight into the nature of organisms, but it can throw light on the character of our own reason. It can represent to us the purposively ordered and goal-directed activity of our own rational capacities, reflected in nature. While we cannot cognize nature as a natural purpose, we can thus find out something about ourselves by considering nature in teleological terms.

Even construed as merely regulative and analogical, the conception of organisms as natural purposes thus relies on a teleological conception of ourselves. Moreover, Kant believes that, as agents in the natural world, we necessarily think of ourselves as acting for purposes. We must regard ourselves as acting intentionally, in particular, when we study the natural world including organic entities and processes. Our reductive ambitions in biology thus have to stop at our own case. Even if we aim to replace teleological reflection with causal-mechanistic explanations of organisms, we cannot eliminate reference to purposes altogether. Moreover, once we have admitted this much teleology into the picture we cannot end here but must also make room for teleological reflection on nature as a whole, including biological phenomena. This is because, in thinking of ourselves as setting ends and acting for purposes, we need a grip on what it means for our rational purposes to be effective in nature. And we cannot make sense of ourselves as acting and realizing ends in nature, according to Kant, unless we also regard nature as itself “a teleological order of things” (*CJ* 5:379).

Two points are important for making sense of this Kantian step from the teleology of our own reason to a teleological construal of nature as a whole. The first

concerns the epistemic status of the required story about reason in nature. On Kant's account, any such story will be purely speculative. Since we cannot achieve determinate understanding of purposes in nature, any account of the relation of reason and nature will be merely regulative. The second point concerns the details of this relation. Kant thinks that we can construe reason in nature only if we assume that nature itself is purposive for the development of reason. And this, in turn, requires that we assume nature has a teleological ground and is, as a result, ordered in its entirety according to relations of purposiveness. The attempt to make sense of ourselves as acting in the natural world, on Kant's account, thus relies not only on a teleological conception of our own rational activities but also, importantly, on extending teleological reflection to nature as a whole. It presupposes the idea of nature as a system in which everything is related as means and ends and thus contains organic entities and processes that maintain and sustain each other. The idea of the whole of nature as purposive for the development and expression of reason thus brings with it the conception of organic beings as natural purposes.²³

Kant elaborates on this speculative account in the *Critique of Judgment* and in other writings on teleology. In *Idea for a Universal History with a Cosmopolitan Aim*, he spells out a teleological “guiding thread” for a history of the realization of reason in nature (*Idea* 8:30). In *Conjectural Beginning of Human History*, moreover, he offers a teleological “conjecture” for construing the origin of reason in nature (*CB* 8:109). In the third *Critique*, finally, he spells out the idea of the whole of nature as a “system of

²³ For a more detailed discussion of the teleological conception of nature as a whole, see Breitenbach 2009a: chapter 6. Watkins 2014b argues that Kant's conception of nature as a system of ends is importantly related to the totalizing urge of the faculty of reason, which extends purposive relations to all of nature.

ends”, purposively ordered and directed at the existence and realization of reason (*CJ* 5:377). Interestingly, here it is the organism as natural purpose that provides the model for this teleological conception of nature as a whole. As Kant puts it,

by means of the example that nature gives in its organic products, one is justified, indeed called upon to expect nothing in nature and its laws but what is purposive in the whole. (*CJ* 5:379)

According to Kant, organisms as natural purposes offer an example for extending teleological consideration to all of nature and, thereby, for representing nature as purposive for human reason. Kant thus construes the unity of nature on the model of the organism, projecting the idea of a purposive system with its own end and its own organizing principle onto that of nature as a whole. On this model, reason, as the final end, is conceived as organically developing out of nature, while ultimately pointing beyond nature itself.

The need to make sense of our own dual nature as rational beings that act in the natural world thus ultimately makes the teleological conception of nature indispensable for us. Even if in the life sciences we aim to reduce considerations according to teleological principles to explanations by means of causal laws, we will nonetheless have to retain the teleological conception of a natural purpose. All progress in the natural sciences notwithstanding, on Kant’s account, our teleological conception of the organism remains irreducible.

I suggest that this indispensability of teleological considerations of nature has crucial implications for Kant’s account of the unity of nature. Two results are particularly important. First, as we have just seen, the teleological conception of organisms as natural purposes helps us elucidate the idea of the unity of nature. In the

introduction I sketched this idea as that of a system of kinds, hierarchically ordered into genera and species. Kant's proposal in the third *Critique* implies that we can shed light on this indeterminate idea by means of the model of organic unity. On Kant's account, organisms function as an analogue, or a symbol, of nature as a whole.

The second implication is that the irreducibly teleological conception of organisms provides us with a reason for picking out living beings as a basic focus of investigation and explanation. As we saw above, according to Kant's idea of the unity of nature, we must presuppose that all natural phenomena are systematically ordered in a hierarchy of genera and species. On this picture, no particular kind of phenomenon is in any way privileged, or has importance over any other. Every phenomenon can be explained, albeit incompletely, by laws on a more general level.²⁴ The need for a teleological conception of organic nature, however, gives us reason in biology to prioritize one of these levels over others. In other words, because of the indispensable need to consider organisms according to irreducible teleological principles we have reason not to reduce the organism concept to anything below or above the organic order. The teleological conception thus guides us in the search for laws and explanations that take the organism concept as basic.

In this general sense, then, the teleological conception of the organism would guide the study of living beings even if we had a fully naturalistic organism concept. It carves out a part of nature as an object of study in its own right. It highlights a level of organization in the hierarchy of kinds on which to focus scientific investigations.²⁵

²⁴ Rauscher 2010: 295 makes this point clearly when he argues that in the systematic unity of concepts in accordance with which we understand the unity of nature "there is no privileged point, with the single exception of a possible highest universal concept at the top."

²⁵ Similarly, Quarfood 2004 has suggested, though for different reasons, that teleological judgment provides biology with its object.

Kant's conception of natural teleology as an irreducible heuristic is thus compatible with, and indeed sheds important light on, his idea of the unity of nature. Kant's regulative account of teleology informs his idea of nature as a lawful unity that leaves room for different sciences with their distinctive concepts and principles.

5. Concluding Remarks

As I have argued in this chapter, Kant's philosophy of science contains two ideas that, *prima facie*, stand in tension with each other. On the one hand, Kant promotes the idea of the lawful unity of nature. According to this idea, all natural phenomena stand under universal *a priori* laws and are ordered in a hierarchy of systematically related empirical concepts and laws. On the other hand, Kant also puts forward the thought that there is a diversity of irreducible concepts and principles, which carve out the domain of distinct sciences and guide our inquiry into particular parts of nature. According to this second idea, different concepts and principles are necessary for different types of scientific inquiry – in particular, regulative teleological principles for biological research. The combination of these ideas raised the question of this chapter. How could phenomena that require such irreducibly distinct principles belong to one and the same law-governed whole?

In response to this question I have argued that Kant's two ideas are compatible and that understanding them in conjunction sheds important light on the idea of the lawful unity of nature. As I have suggested, the indispensability of irreducible teleological principles in biology is grounded in a central fact about ourselves, in our need to make sense of the possibility of reason in nature. Only if we leave room for principles of purposiveness can we make sense of nature as including

ourselves as rational and purposively acting beings aiming to understand the natural world. Furthermore, as regulative principles, teleological laws not only are compatible with the unity of nature but, crucially, function as means to identify the object of biological inquiry. They guide research into particular kinds of natural phenomena and the biological laws that govern them.

On the reading of Kant I have put forward, organic entities and processes are thus part of the lawful unity of nature, and biological laws are possible. Far from falling out of nature and the domain of the natural sciences, as some readers have concluded, there can be a genuine science of organic phenomena and of the laws that govern them. We can hold on to Kant's conception of the lawful unity of nature, while making room for a plurality of irreducible concepts and laws.

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