ZUR DISKUSSION

Logical Form and the Order of Nature

Comments on Beátrice Longuenesse's *Kant and the Capacity to Judge*

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Béatrice Longuenesse's new book, translated, in somewhat revised form, from the original French version first published in 1993, is an original and illuminating treatment of the relationship between concepts and intuitions, sensibility and discursivity, in Kant's critical project.[1] Whereas many commentators have found it difficult to take seriously the so-called metaphysical deduction of the categories – where Kant attempts to derive the pure concepts of the understanding from the logical forms of judgement – Longuenesse places this much maligned Kantian argument at the very center of her interpretation. She investigates in detail the relationship between each pure concept of the understanding and its corresponding logical form (substance and categorical judgement, causality and hypothetical judgement, and so on), and she provides an equally detailed discussion of how each such correspondence is systematically carried through from the mataphysical deduction, through the trancendental deduction, the schematism, and finally the principles of pure understanding. Moreover, we can only properly appreciate this systematic correspondence between logical form and category, Longuenesse argues, if we understand how 'the capacity to judge [*das Vermögen zu urteilen*]' also operates on sensibility (the pure intuitions of space and time) so as to prepare the sensible given for conceptualization – for the formation of concepts, judgeable contents, and (eventually) subsumption under the categories. In this way, a transcendental-psychological theory of sense perception complements the purely logical or discursive theory of concepts and judgements so as to secure a kind of necessary harmony between the two: our sense-perceptions are necessarily subject to the capacity to judge and thus to the categories.

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[1] Béatrice Longuenesse, *Kant and the Capacity to Judge: Sensibility and Discursivity in the Transcendental Analytic of the Critique of Pure Reason* (Princeton: 1998). Page references to Longuenesse's book are given parenthetically. References to Kant's works are given in the standard way by pagination of the first (A) and second (B) editions of the *Critique of Pure Reason*, and, for all other works, by volume and page numbers of the Akademie edition of *Kants gesammelte Schriften* (Berlin: 1902–). All translations from Kant's writings, unless otherwise noted, are my own.

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Longuenesse begins by taking an important clue from Kant's contrast between the *logical* and the *real* use of the understanding in §§ 5–8 of the *Inaugural Dissertation* of 1770. Here Kant explains the logical use of the understanding as that by which we subordinate sensible cognitions to ever more general concepts and, at the same time, we thereby subordinate sensible phenomena to ever more general (empirical) laws. In this way, in particular, we proceed from unreflective sensory *appearances* to what Kant there calls *experience*: "the reflective cognition that arises when several appearances are compared by the understanding". What Kant here calls experience thus arises by conceptual abstraction and generalization from the initial sensory given. The real use of the understanding, by contrast, proceeds wholly independently of sensibility. It involves characteristically metaphysical concepts – such as "possibility, existence, necessity, substance, cause, and so on" – which do not arise by abstraction and generalization from the sensory given but rather from "the very nature of the understanding" itself. The problem which then immediately arises, however, and is reported in Kant's famous letter to Herz of February 21, 1772, is to comprehend how the real use of the understanding, together with its characteristic 'pure' (non-sensory) concepts, can nonetheless relate to objects. In particular, since the concepts produced by the real use of the understanding do not arise (as do ordinary empirical concepts) by abstraction from objects that are given to us, but are rather generated a priori by the mind itself, how can they acquire relation to objects nonetheless – whether to sensible objects (phenomena) or to non-sensible objects (noumena)?

What Kant came to see, according to Longuenesse, is that the real use of the understanding, together with its characteristic pure concepts, is inextricably intertwined with its logical use. This is because the operations by which we ascend from the sensible given via conceptual generalization (the operations of comparison, reflection, and abstraction) proceed in accordance with logical forms (the very logical forms catalogued in Kant's table of judgements), and *the pure concepts of the understanding are originally nothing but these logical forms.* Therefore, since experience itself (as distinct from mere unreflective appearance) arises precisely from the operations of the logical use of the understanding, experience is necessarily subject to the pure concepts of the understanding (p. 27). In this way, the gap between the logical use of the understanding and its real use is closed, and the pure concepts of the understanding obtain a necessary relation to objects – which, however, are necessarily restricted to sensible objects (phenomena) and cannot therefore include non-sensible objects (noumena).

But the story is far from over. For, Longuenesse suggests, since we have now shown that the logical use of the understanding is inextricably intertwined with pure 'metaphysical' concepts – the very concepts at which Hume's skeptical arguments were directed – a parallel skepticism may now arise with respect to the logical use of the understanding itself. What justifies our right to proceed from the sensible given in accordance with pure intellectual concepts in this way? Here, parallel to her original interpretation of the logical forms of judgement, Longuenesse provides an equally original interpretation of the 'figurative synthesis' or 'transcendental synthesis of the imagination' Kant introduces in the second half of the B edition transcen-

dental deduction to explain, in his own words, "the application of the categories to objects of the senses in general" (§ 24). For Longuenesse, this 'action of the understanding on sensibility' is a pre-conceptual synthesis that the understanding exerts on the pure forms of spatial and temporal intuition *as a capacity*, prior to all conceptualization and judgement, and thus prior to all *realization* of this capacity in fully reflective, categorized experience. As a result of this synthesis, the not yet conceptualized appearances can be necessarily read, as it were, as appearances of a law-governed order of nature consisting of substances interacting with one another in space and time – and thereby, at the same time, as representing a multiplicity of distinguishable singular objects systematically subsumable under general concepts. In this way, since the subsequent 'reading' of appearances as experience by the logical use of the understanding is the realization of the very same capacity (*das Vermögen zu urteilen*) by which the appearances themselves are first 'taken up' into sensibility, sensibility and understanding stand in a necessary harmony, our right to apply the pure concepts of the understanding is vindicated, and Humean skepticism is finally overcome.

For Longuenesse, then the key to understanding the metaphysical deduction of the categories – and, indeed, their transcendental deduction as well – is to recognize that the primary function of Kant's logical forms of judgement is precisely their role in what Kant had earlier, in the *Inaugural Dissertation*, called the logical use of the understanding: the use of the understanding in inductively ascending from the sensory given to systematically ordered general concepts and laws by the operations of comparison, reflection, and abstraction. This interpretation, as Longuenesse emphasizes, places the central argument of the *Critique of Pure Reason* in very close connection with that of the *Critique of Judgement*, where the notion of 'reflective judgement' is introduced in order to guide the process of empirical concept formation (together with the search for ever more general empirical laws) towards the maximum possible systematic unity. For Longuenesse, judgement in the first *Critique* is just as reflective as in the third; the difference between the two is rather that the first type of judgement is *also* 'determinative': unlike the 'merely reflective' judgement treated in the third *Critique*, it *succeeds* in subsuming the sensible given under empirical concepts – and eventually under the pure concepts of the understanding as well (the ideal of complete systematic unity, by contrast, is necessarily never actually attained).

Longuenesse is well aware that this interpretation of the role of judgement in the first *Critique* will strike some readers as excessively empiricist, as giving insufficient weight to the way in which the pure concepts of the understanding appear to determine the possibility of experience from the 'top-down', by generating synthetic a priori principles which then structure the form of our experience of nature prior to all inductive generalization and empirical concept formation (p. 11 f.). And Longuenesse attempts, accordingly, to develop a detailed response to this kind of objection throughout her book. In spite of this, however, I myself still remain wedded to a 'top-down' style of interpretation. What I find, however, is that Longuenesse's richly developed articulation of a contrary mode of interpretation allows me, by way of contrast, to exhibit the strengths of a 'top-down' interpretation in a particularly interesting and convincing fashion. – Or so, at least, I shall argue.

The best way to bring out some of the fundamental ambiguities, and ultimately quite deep tensions I find in Longuenesse's account is to take a closer look at her treatment of particular examples of the correspondence between logical forms and respective categories. I will look, more specifically, at her treatment of the categories of quantity (unity, plurality, totality) and relation (substance, causality, community).

The logical forms of judgement corresponding to the categories of quantity are universal, particular, and singular. For Longuenesse, the essential movement of thought here is from singular sensible items thought under some concepts ('This body is heavy', 'This other body is heavy', etc.) to a particular (or as Kant also puts it 'pluralitive') judgement involving the very same concepts ('Some [a number of] bodies are heavy'), to a parallel universal judgement ('All bodies are heavy').[2] The corresponding role for the categories of quantity, according to Longuenesse, is to think the extension of some general concept – the set of singular items thought under this concept – in such a way that it can then be counted or enumerated. In this way, Kant's conception of quantity turns out to be very similar, for Longuenesse, to Frege's later conception of number – as a notion that attaches primarily to the extension of a given concept and assigns a (cardinal) number to such a collection of objects so conceptualized. Finally, the figurative synthesis or transcendental synthesis of the imagination corresponding to these categories – the *schema* of the categories of quantity – is that spatio-temporal synthesis by which extensions of concepts in general are placed in space and time as 'homogeneous multiplicities' countable or enumerable by successive iteration or synthesis ('Here is one body', 'Here is a second body', 'Here is a third body', etc.). This, according to Longuenesse, means that space and time are themselves infinite and continuous magnitudes in which a unit of measure (e. g., a cubic foot of space) may be chosen arbitrarily and then indefinitely repeated ('Here is one cubic foot of space', 'Here is another', etc.). In this way, the pure intuitions of space and time, as synthesized by the capacity to judge expressed in the quantitative logical forms, provide, on Longuenesse's account, something like a primitive mathematical theory of sets or aggregates – a general theory of the possible extensions of concepts (p. 276). But this theory, unlike Frege's theory of extensions or Cantor's theory of sets, applies only to sensible, that is, spatio-temporal objects.

This is a fascinating and imaginative reconstruction of Kant's theory of quantity. But it suffers from a fundamental, and to my mind fatal ambiguity. Let us grant that space and time supply the 'places', as it were, within which the singular objects constituting the extensions of concepts are necessarily found. Let us also grant that such singular objects are counted or enumerated by successive iteration in time. Why

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[2] Longuenesse thus follows a well-known paper by Michael Frede and Lorenz Krüger, "Über die Zuordnung der Quantitäten des Urteils und der Kategorien der Größe bei Kant", *Kant-Studien* 61 (1970), pp. 28–49, in taking the correspondence between categories and forms of judgement to be reversed in Kant's published tables. This correspondence, according to Frede and Krüger, should align singular judgement with unity and universal judgement with totality rather than the other way around.

should it follow that space and time are *themselves* infinite and continuous magnitudes that can be measured by an arbitrary choice of some unit (feet, inches, meters, seconds, etc.)? For this latter feature of space and time serves not so much to assign the extension of a concept (the set of objects falling under it: bodies, houses, etc.) a given number, but rather to assign the individual spatio-temporal objects themselves (*this* body, *this* house, etc.) particular *sizes* or *magnitudes.* As far as I can see, Longuenesse's exposition simply slides from the first use of the idea of quantity (assigning numbers to sets of objects) to the second (assigning individual sizes or magnitudes to particular objects) with no real argument connecting the two. For it simply does not follow from the idea that space and time provide the 'places' for the extensions of concepts, and thereby secure the application of *discrete* quantity or number to these objects (*qua* items falling under a concept), that space and time are also infinite and continuous magnitudes which thereby secure the application of the mathematics of *continuous* quantity to these same objects.

In Kant's own exposition of the categories of quantity, by contrast, the mathematics of continuous quantity is actually primary. The central instances of the categories of quantity are the 'extensive magnitudes' of space and time, which are themselves continuously generated, as magnitudes, by the successive synthesis of their parts. Since space and time are both continuous and homogenuous, an arbitrarily chosen unit (e. g., a cubic foot of space) can be chosen and then added to itself by successive synthesis to generate any given spatio-temporal magnitude. Hence, any appearance in space and time is also a continuous magnitude that can be similarly measured by an arbitrarily chosen unit and thereby assigned a determinate size. For Kant himself, therefore, there is no transition from the mathematics of discrete quantity (number) to that of continuous quantity (magnitude). On the contrary, the continuous case is prior, and the mathematics of discrete quantity is then parasitic on this case. As is traditional, number is conceived in terms of the addition of line segments with an arbitrarily chosen unit, say, rather than in the Fregean style in terms of the extension of concepts.[3] This is all to the good; for, as we have seen, whereas discrete quantity can be conceived as a special case of continuous quantity, the reverse direction is in fact quite impossible.

Lying behind this fundamental ambiguity in Longuenesse's account of the categories of quantity is a deeper issue concerning the application of mathematics to

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[3] Thus, the central example of the application of the categories of quantity in § 20 of the *Prolegomena* is the measurement of a straight line segment. The central example in § 26 of the B edition transcendental deduction involves constructing the outline of a house (presumably to measure its size or volume). Kant asserts the priority of continuous over discrete quantity (in counting a number of coins) at A170f./B212. In reference to the issue about the order of the categories of quantity raised in note 2 above, Manley Thompson has persuasively argued, in "Unity, Plurality, and Totality as Kantian Categories", *The Monist* 72 (1989), pp. 168–189, that Kant's example of *continuous* quantity in § 20 of the *Prolegomena* counts decisively against Frede's and Krüger's analysis and in fact supports the published tables.

nature in general. A central feature of the scientific revolution of the sixteenth and seventeenth centuries is the radically new idea that *all* natural objects – including those in what was formerly taken to be the distinctive, sublunary region around the earth – are describable with the maximum precision of which mathematics is capable; *for all such objects occur in a single, infinite and continuous, three-dimensional Euclidean space.* Geometrically exact laws then suffice to describe the behavior of all natural objects on this view – which was articulated philosophically in such conceptions as the distinction between primary and secondary qualities, Descartes's doctrine that the essence of body is extension, and so on. Kant's argument, in the axioms of intuition, that the corresponding principle "makes pure mathematics, in its complete precision, applicable to objects of experience", so that "what geometry says of pure intuition is valid without question for empirical intuition", is simply his own particular version of this radically new optimism about a fully mathematical science of nature (A165 f./B206 f.). Yet the much older, and at bottom thoroughly Aristotelian view of the formation of general concepts by generalization and abstraction, by which we ascend from the sensible particulars step by step to generate a system of ever more general superordinate concepts, places no such stringent mathematical demands on nature. Given a (sortal) concept like 'human being', say, it makes sense to ask how many singular objects fall in its extension: counting, number, and the mathematics of discrete quantity are of course then applicable. But this is a far weaker 'application' of mathematics, as we have seen, than that embodied in the mathematics of continuous quantity; and only the latter can answer to the radical ambitions of the new mathematical science.

This tension between an essentially Aristotelian account of concept formation, on the one hand, and the demands of the new mathematical science of nature, on the other, shows up particularly clearly in Longuenesse's treatment of the relational categories articulated in Kant's analogies of experience, for it is here that the distinctively Kantian conception of the order of nature is most fully expressed.

Kant's correspondence between relational categories and logical forms of judgement coordinates substance with categorical judgement and causality with hypothetical judgement. Longuenesse traces this correspondence back to Wolffian German *Schulphilosophie*, where a categorical judgement is understood as attributing a predicate to a subject with no 'added condition' ('All bodies are divisible'), whereas a hypothetical judgement attributes a predicate to a subject only relative to or under an 'added condition' ('If all bodies are composite, then they are divisible'). When moving from logical form to corrensponding category, Longuenesse suggests, "[Kant's] explanation of the category of substance is [...] inspired by Aristotle, via Wolff and German *Schulphilosophie*" (p. 325). Some predicates of a subject can be thought of as 'reciprocal' with this subject, in that they express *essential properties* which cannot change without the subject itself losing its identity. In the judgement 'Some man is learned', for example, the concept 'man' cannot be denied of a subject (e. g., Socrates) without this subject losing its essential nature; whereas the very same subject can easily change from ignorant to learned and back again. The concept 'man' is therefore the concept of a substance, while the concept 'learned' is not: the latter concept is attributable to any particular instance of the concept 'man' only under an 'added condition' (e. g., 'having undergone years of study', or the like).

This fundamentally Aristotelian conception of the distinction between essential and accidental properties of an individual substance then leads naturally to Longuenesse's explanation of the spatio-temporal schema of the concept of substance, and to her account of the connection between the two relational categories of substance and causality. The schema of the concept of substance (more precisely, of the distinction between substance and accident) is permanence over time (more precisely, the distinction between properties that persist over time and those that change). Socrates cannot change from human to non-human without losing his identity, but he can change from ignorant to learned. All changes or alterations, then, are to be conceived as changes in some substance, as one or another accidental property gives way to its opposite. But any such change involves us necessarily with hypothetical judgements, since they involve attributing a predicate to a subject only relative to or under some 'added condition'. And this involves us, at the same time, with the category of causality, for here we are necessarily inquiring after the reason or cause for the given change (of the transition from ignorance to learning, for example). If we are to subsume individual objects under predicates 'reciprocal' with them, therefore, so as to make possible the identification and reidentification of such objects under general concepts, we must employ both the categories of substance and causality: we must take the sensory given as furnishing appearances of individual substances causally interacting with one another in space and time. In Longuenesse's account, finally, the third relational category, that of community, does not really add anything new to this picture. Whereas the logical form of disjunctive judgement serves to express "the form of the universal subordination of genera and species towards which cognition tends" (p. 105), the category of community expresses "the universal community of substances" (p. 387) whereby they are placed in "a system of external relations by means of which we recognize their essential and inessential properties" (p. 386).

Yet the fundamentally Aristotelian conception of nature which thus emerges from Longuenesse's account stands in stark opposition to Kant's own, more Newtonian conception of nature, and this results in serious ambiguities and tensions in Longuenesse's analysis. The Aristotelian conception of individual substance, for example, is that of a particular natural object falling under some natural kind. A particular member of a natural kind, such as an individual human being, cannot cease to be a member without losing its essential identity. Nevertheless, such an individual member of a kind may of course cease entirely to exist – or, correspondingly, may come into existence after a time when it has not yet existed – so that for Aristotle there are two essentially different types of natural change: generation and corruption of an individual substance, on the one hand, and change in the accidental properties of such a substance, on the other. But the entire point of Kant's argument in the first analogy (then reiterated at the beginning of the B edition second analogy), is that only the second type of change is possible: substance itself can neither arise nor perish, and is thus, unlike individual members of a natural kind, absolutely permanent throughout all time. Accordingly, Kant's own central example of substance is not individual members of a natural kind but rather *matter* – the basic physical stuff out of which all natural objects are composed and whose total quantity in

nature is necessarily conserved.[4] Longuenesse is perfectly aware of this, of course, and in her initial exposition of Kant's conception of substance as the underlying substrate empirically representing time itself she rightly emphasizes the *absolute* permanence of Kantian substance (pp. 337–340). Because of her own essentially Aristotelian reconstruction of Kant's move from logical form to category in this case, however, she is later continually driven to speak rather of the merely *relative* permanence characterizing individual members of a natural kind: "The 'objects of perception', that is, the objects to which sensations are intentionally related, are the substrates of changing determinations (relatively permanent objects, substances) in relations of community with all other substances in space" (p. 392).[5]

Similarly, on the Aristotelian conception of the community of substances in space, there is no particular need for *reciprocal* interaction. The sun influences changing objects on the earth, for example, but, since the sun undergoes no actual change itself, neither the earth nor objects upon it influence the sun in turn. In Kant's Newtonian conception, by contrast, every action must have an equal and opposite reaction, and so the earth does necessarily influence the sun in turn – through its own (relatively small) gravitational force. Indeed, on Kant's fundamentally Newtonian conception of the community of substances, *every* substance (every piece of matter) necessarily interacts with *every other* such substance. Longuenesse does not identify Kant's conception of community as specifically Newtonian, but she does conceive it as involving thoroughgoing universal reciprocal interaction in precisely the same sense.[6] Since her conception of nature is fundamentally Aristotelian, how-

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[4] Both Gordon Brittan, in *Kant's Theory of Science* (Princeton: 1978), p. 143 f., and Henry Allison, in *Kant's Transcendental Idealism* (Yale: 1983), pp. 212–215, have discussed the question of 'Aristotelian' (individual subject of predication) vs. 'Cartesian' (material substrate of change) conceptions of substance in Kant. In light of Kant's explicit denial of substantial change, I myself believe that an Aristotelian conception is definitively excluded: for Kant, the idea of an *ultimate* subject of predication and change implies that substance can only be matter. For further discussion, see my "Matter and Material Substance in Kant's Philosophy of Nature", in H. Robinson, ed., *Proceedings of the Eighth International Kant Congress* (Milwaukee: 1995), vol. 1.2, pp. 595–610. Longuenesse (p. 345 n. 35) takes Kant's assertion of a *quantitative* conservation law in the B edition version of the first analogy to be quite unwarranted from the transcendental viewpoint of the first *Critique.* Unfortunately, she does not consider the tension between 'Cartesian' and 'Aristotelian' conceptions of substance raised by Brittan and Allison.

[5] Compare, e. g., (p. 373): "For the alteration of any (relatively permanent) object given in space and time, there has to be a reason, or cause". Unfortunately, Longuenesse does not fully explain the relationship between absolute and relative permanence in her view; and, more generally, she fails to appreciate the essentially anti-Aristotelian character of the *absolutely* permanent conception of substance (and the consequent tension between 'Cartesian' and 'Aristotelian' conceptions).

[6] "In the Third Analogy, Kant's argument is that each thing, with its specific determinations, is supposed to be the cause (as well as the effect) of the specific determinations of all the things perceived as simultaneous with it, while being

ever, I do not see how Longuenesse's attempted reconstruction of Kant's argument for such truly universal and reciprocal interaction can possibly work. It simply does not follow that only such a Newtonian conception of interaction (which is actually quite incredibly strong) can make possible concept formation generating a "universal subordination of genera and species" in virtue of which individual instances of natural kinds are placed in "a system of external relations by means of which we recognize their essential and inessential properties".

In order to appreciate the full force of Kant's fundamentally Newtonian conception of the order of nature, however, we need to consider Longuenesse's more detailed treatment of the category of causality – which, as one might expect, highlights the role of the hypothetical logical form in our causal judgements. The function of hypothetical judgements, for Longuenesse, is to give the ground or reason whereby an individual substance is thought as determined with respect to one or another of its accidents. To take Kant's example from the *Prolegomena*, although it is not true that all stones are warm, it is true that all stones, if heated sufficiently by the sun's light, grow warm. The sun's light thus provides the antecedent for a *modus ponens* inference where a stone's becoming warm is the consequent. To use the language Kant again inherits from German *Schulphilosophie*, the ground (the sun's light) thereby allows us, in this sense, to *posit (ponere)* the conclusion (the determination of the stone by the predicate 'warm'). This much, as Longuenesse helpfully shows, is perfectly traditional in the logic of the schools. But in the 1760s Kant becomes convinced (perhaps by exposure to the recent translation of Hume's *Enquiry*) that there is a centrally important distinction between two essentially different types of grounds: *logical* grounds, where the hypothetical judgement in question is analytic (e. g., 'If the world is finite, then it is imperfect and contains evil'), and *real* grounds, where the hypothetical judgement is not analytic (as in our example from the *Prolegomena*). Kant's problem, accordingly, becomes how to understand the nature of the connection in this latter, synthetic case. What connects ground to consequent when this connection is not contained in the concepts themselves?

In the critical period, of course, this difficulty is addressed in Kant's full-scale engagement with what he now calls 'Hume's problem'. And Kant's solution, according to Longuenesse, is remarkably close to Hume's own: what connects ground to consequent in the synthetic case is simply the repeatedly observed constant conjunction of instances of the former followed by instances of the latter (e. g., of the sun's light followed by heat). But, unlike Hume, Kant does not attribute our extrapolation from observed constant conjunction to as yet unobserved cases to the associative empirical imagination. On the contrary, it is precisely the *transcendental* imagination, guided by the capacity to judge, that carries out, and thereby justifies, the extrapolation. Kant argues, more specifically, that only the formation of hypothetical judge-

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itself (as far as its determinations are concerned) the effect [of] all things simultaneous with it". (p. 390) Although Longuenesse herself does not call attention to this, it is worth noting that Kant's main examples of community appear to be taken from Newtonian gravitational astronomy: the earth-moon system at B257 f., the system of "heavenly bodies [*Weltkörper*]" at A213/B260.

ments allows us to perceive objective temporal succession in the first place (and *a fortiori* constant or *repeated* temporal succession). To perceive a stone's growing warm at a determinate time necessarily involves the supposition of a general rule of succession allowing us to infer this event as the conclusion of a hypothetical syllogism. Experience of constant conjunction then puts us in a position to establish what the general rule of succession actually is in this particular case (p. 370). Precisely because the perception of an event is only possible in the first place in virtue of the transcendental synthesis of the imagination carried out by the capacity to judge in the formation of hypothetical judgements, our extrapolation from observed constant conjunctions to general empirical causal laws is thereby justified.

However, as Longuenesse herself is perfectly aware, this cannot be the full story of Kant's answer to Hume. Kant explains what is still missing in the very passage from the *Prolegomena* where he officially presents his 'answer':

> [I]t is possible that in perception we may meet with a rule of relation which runs thus: that a certain appearance is constantly followed by another (though not conversely); and this is a case for me to use the hypothetical judgment and, for instance, to say that if the sun shines long enough upon a body it grows warm. Here there is indeed as yet no necessity of connection, or concept of cause. But I proceed and say that if this proposition, which is merely a subjective connection of perceptions, is to be a judgment of experience, it must be regarded as necessary and universally valid. Such a proposition would be that the sun is by its light the cause of heat. The empirical rule is now considered as a law, and as valid not merely of appearances but valid of them for the purposes of a possible experience which requires universal and therefore necessarily valid rules.[7]

Here, at the outset, we have both constant succession and an application of the hypothetical form of judgement, but this, as Kant says, is by no means sufficient to secure true *necessity of connection* and thus a genuine causal law. So it is far too weak, in particular, to justify our transition from observed constant conjunction to the extrapolation of a causal relation. We still need somehow to convert the merely subjective judgement of perception into a fully objective judgement of experience, to transform the mere empirical *rule* into a true universally valid general *law*.

At this point Longuenesse invokes Kant's references to Francis Bacon and argues that the crucial transition in question is the product of a Baconian inductive method, which proceeds by systematically comparing many inductive extrapolations with one another. As any given judgement of perception is systematically subject to many additional inductive tests, it gradually becomes better and better incorporated into the totality of experience and thereby becomes (eventually) a judgement of experience; so it is precisely such a systematically applied experimental method, for Longuenesse, that turns a judgement of perception into a judgement of experience.[8] Yet

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[7] *Prolegomena*, § 29, Ak. 4, p. 312. I here use the translation provided by Longuenesse (see note 8 below).

[8] See pp. 176–179, which include the above passage from § 29 of the *Prolegomena*. Just after quoting this passage Longuenesse explains (p. 179) that the judgement of perception is further determined so as to become a judgement of experience

this idea, I am afraid, is one of the weakest points in Longuenesse's entire argument. For Kant emphasizes repeatedly that a merely inductive or experimental method, no matter how systematically applied can never yield natural scientific knowledge in his sense, which requires *strict* as opposed to merely *comparative* universality for natural laws. Such strict universality "is certainly not a property of empirical rules, which, through induction, can possess nothing but comparative universality, i. e., extended utility" (A91 f./B124).[9] Thus, in the Preface to the *Metaphysical Foundations of Natural Science* (1786), Kant explains why chemistry, although it certainly contains a system of empirically tested generalizations, nevertheless cannot count as a genuine science: "[Chemical] laws or principles carry with them no consciousness of their *necessity* (they are not apodictally certain), and thus the whole of cognition does not deserve the name of a science in the strict sense. Chemistry should therefore be called a systematic art rather than a science". Kant concludes that only *pure* natural science, based, in the end, on synthetic a priori laws of nature, can make genuine *empirical* natural science first possible.[10]

There can be no doubt, therefore that Kant's own conception of natural science is profoundly non-Baconian. All natural science, for Kant, rests on what he calls its 'pure part', which consists wholly of synthetic a priori laws of nature. These synthetic a priori laws include the principles of pure understanding, of course, but they also include such fundamental principles of the Newtonian theory of motion as the conservation of mass and the equality of action and reaction (B19 f.) – which principles, as Kant explains in the body of the *Metaphysical Foundations*, are derived from

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"by confronting the correlations already obtained with many more, while perhaps also using the resources of mathematical construction to anticipate and test further possible empirical correlations. Only after such a method has been systematically applied can a causal connection be asserted: 'the sun warms the stone'".

[9] In a rare but revealing slip, Longuenesse cites a passage from A195 f./B240 f. in the second analogy in support of the claim that "[l]ike Hume, Kant considers that we cognize particular causal connections only empirically" (p. 370, and note 78 thereto). The sentence Longuenesse cites does not express Kant's own view, however, but rather what Kant takes to be the commonly held conception of a merely inductive basis for the concept of cause. In the next sentence Kant says: "On such a basis this concept [of cause] would be merely empirical, and the rule that everything that happens has a cause would be just as contingent as the experience itself: its universality and necessity would then be only falsely imputed and would have no true universal validity, because they would not be grounded a priori but only on induction". It is clear, then, that Kant is making essentially the same point here as he does at A91 f./B124. More generally, whereas Hume himself has no problem with a Baconian inductive method (on the contrary, this is his very model of good scientific procedure), Kant has a much stronger (and more rationalistic) conception of science.

[10] Ak. 4, p. 468 f. Longuenesse acknowledges the fundamental importance of natural science, and thus the *Metaphysical Foundations*, in Kant's conception of judgements of experience (pp. 174 f., 192 n. 43); but she does not appear to appreciate the all-important role of *pure* natural science there.

the corresponding principles of pure understanding (here those of substance and community) by an instantiation via the empirical concept of matter. And, as Kant further shows in this latter work, the general principles of the Newtonian theory of motion, viewed as synthetic a priori fundamental laws of nature in this way, then serve to provide an a priori grounding for Kant's central example of an *empirical* law of nature – the law of universal gravitation – by structuring or framing the purely empirical or inductive basis for this law (Kepler's rules of planetary motion) within an additional basis of synthetic a priori principles. Kepler's merely empirical rules, as I have argued in detail elsewhere, are thereby transformed into a truly necessary and strictly universal law: a mere judgement of perception is converted into a genuine judgement of experience.[11]

But this means, finally, that Kant's critical conception of experience is profoundly different from that of the *Inaugural Dissertation* – and this, from my point of view, is the most fundamental problem with Longuenesse's analysis. In the *Inaugural Dissertation* the logical use of the understanding leads from unreflective appearance to what Kant there called experience by "the reflective cognition that arises when several appearances are compared by the understanding".[12] However, such a procedure, on the critical conception, can only lead to mere *comparative* universality and thus to what Kant now calls mere judgements of perception. Experience, as opposed to mere appearance, is now possible "only through the representation of a necessary connection of perceptions" (B218). And such necessity of connection can only arise, in turn, from a radically reconceived version of the *real* use of the understanding, whereby empirical laws of nature are viewed as determined, step by step, by synthetic a priori laws, starting from the principles of the pure understanding themselves, so that all empirical laws may be viewed as "particular determinations of yet higher laws, among which the highest (under which all others stand) originate a priori in the understanding itself, and are not borrowed from experience but rather provide

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[11] See my "Causal Laws and the Foundation of Natural Science", in Paul Guyer, ed., *The Cambridge Companion to Kant* (Cambridge: 1992), pp. 161–199, especially § IV. A central point here is the way in which judgements of experience are subsumed under the category of *necessity*. Longuenesse does not explicitly discuss the modal categories in this connection, and she suggests rather that what confers necessity on a synthetic connection (real ground) is "the supposition of the *continuous preservation through time* of the synthetic connection (regularly repeated connection) to which only experience gives us access" – where this supposition itself rests on the formal intuition of time as an infinite continuous magnitude and the anticipations of perception (p. 374 f.). However, this still does not explain what justifies such a supposition in any *particular* case – for this we need the additional content provided by the *dynamical* categories (and especially the modal categories).

[12] Longuenesse explicitly argues that Kant's critical conception of experience is essentially the same as that of the *Inaugural Dissertation* (p. 26): "The term 'experience' [in § 14 of the transcendental deduction] should be understood as it was defined in the *Dissertation*: 'reflexive cognition, which arises when several representations are compared by the understanding'".

appearances with their law-governedness, and precisely thereby make experience possible" (A126 f.). Only such an essentially 'top-down' procedure, in which empirical laws are successively determined by synthetic a priori principles of the understanding, can explain how a judgement of perception can be converted into a judgement of experience. So only the possibility of such a procedure can justify, in opposition to Hume, our extrapolation of genuine causal connections and causal laws from merely empirical and inductive observed regularities.[13] Just as Kant has a fundamentally Newtonian, and therefore anti-Aristotelian conception of the order of nature, he has a similarly Newtonian, and therefore non-Baconian conception of the epistemological status of this order, whereby our knowledge of nature is capable of a much higher grade of certainty (at least as an ideal) than anything that a merely inductive method, no matter how thoroughgoing and systematic, can possibly supply.[14]

In 1910 the neo-Kantian philosopher Ernst Cassirer argued that the traditional theory of the concept, as represented by the relations of subordination and superordination characteristic of Aristotelian logic, is responsible for both the errors of traditional rational metaphysics and those of traditional empiricism.[15] Traditional rational metaphysics mistakenly takes the fundamental nature of reality to be delim-

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[13] Longuenesse considers my analysis in the paper cited in note 11 above, and concludes (p. 183 n. 31) that it fails to address the question of right or justification proper to the *Critique.* This is indeed a crucial issue, and my claim here is that only the *possibility* of an essentially 'top-down' determination from a priori laws of the understanding can justify us in making the transition to a judgement of experience – and thereby applying the dynamical categories – in any particular case. If such a determination *cannot* be given in some particular case, then the transition to a judgement of experience turns out not to be justified.

[14] Rose-Mary Sargent, in *The Diffident Naturalist: Robert Boyle and the Philosophy of Experiment* (Chicago: 1995), presents an illuminating portrayal of Boyle's systematic experimental method, based on what Boyle terms the 'concurrence of probabilities' provided by a wide variety of experimental and inductive tests, as the true seventeenth century heir to Baconianism. Sargent contrasts Boyle's modest and experimental style of presentation, which eschews mathematical demonstrations and aims merely at a 'moral' certainty, with Newton's own claims to establish demonstrative results via 'deductions from the phenomena' yielding a correspondingly mathematical certainty (*op. cit.*, p. 184). In this connection, it is especially significant that Kant takes the Boylean province of chemistry to be merely "a systematic art rather than a science". Kant thereby emphasizes the fundamental difference between Newton's method and Boyle's (whereas Hume's picture of natural science glosses over precisely this fundamental difference).

[15] *Substanzbegriff und Funktionsbegriff* (Berlin: 1910); translated as *Substance and Function* (New York: 1953). Longuenesse is familiar with Cassirer's book, and she takes pains (p. 193 f.) to dispute the account of judgements of perception and judgements of experience Cassirer presents there. My point here, however, is much more general, and does not depend on accepting Cassirer's particular account of this Kantian distinction.

ited by the relation between subject and predicate, substance and accident; traditional empiricism mistakenly takes the fundamental mode of concept formation to be abstraction from experience, as we gradually ascend to ever higher superordinate concepts from the sensory given. Cassirer's main point is that the traditional theory of the concept must now be completely overturned, so that, in particular, the fundamental mode of concept formation is rather represented by the essentially relational or 'functional' conceptual structures characteristic of modern mathematical science, in which a system of order is generated a priori in the mind, and some or another empirical phenomenon is then incorporated within it. From this point of view, there is a deep and pervasive tension between the theory of the concept in traditional logic and the conceptualization of nature provided by modern mathematical science, and it is precisely this tension that now spells the downfall of both traditional rationalism and traditional empiricism.

Béatrice Longuenesse's new book, I have suggested, runs into serious trouble by failing to appreciate that there is, in fact, a fundamental tension of this kind. Perhaps a more charitable reading, however, is that Longuenesse has strikingly brought out (without being aware of it explicitly) how the very same tension is reflected in Kant's metaphysical deduction of the categories, as Kant struggles to forge a synthesis of rationalism and empiricism that can do justice to the Newtonian mathematical science of nature he takes as his model.[16] From this point of view, I believe, Longuenesse has indeed perceptively illuminated important aspects of this problem lying at the heart of Kant's theory of the categories. Nevertheless, since she herself does not explicitly acknowledge the problem, Longuenesse does not pose what is now – in the wake of her book – the central question: does Kant have the resources to resolve it?

[16] In this task, as I hope to have made clear, one of Kant's central problems is thus reconciling traditional Aristotelian logic with the new conception of nature of modern mathematical science. And it is worth pointing out, as a referee for the *Archiv* has emphasized, that precisely here lies one of the deepest points of affinity between Leibniz and Kant. I would add that Kant's *Newtonianism*, among other things, places this problem in a completely different light for him.