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978-0-521-19839-4 - Kant's Construction of Nature: A Reading of the Metaphysical Foundations of Natural Science

Michael Friedman

Excerpt

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Introduction: The place of the Metaphysical Foundations in the critical system

The *Metaphysical Foundations of Natural Science* appeared in 1786, at the height of the most active decade of Kant's so-called "critical" period – which began with the first edition of the *Critique of Pure Reason* (1781) and included the *Prolegomena to any Future Metaphysics* (1783), the *Groundwork of the Metaphysics of Morals* (1785), the second edition of the *Critique of Pure Reason* (1787), the *Critique of Practical Reason* (1788), and finally the *Critique of the Power of Judgement* (1790). The *Metaphysical Foundations*, however, is by far the least well known of Kant's critical writings. Although it has received some significant scholarly attention during the more than 200 years that have elapsed since its first appearance, it has received far less than most other Kantian works, including some of his earlier writings on natural science and metaphysics from the "pre-critical" period. The reasons for this are not far to seek. The *Metaphysical Foundations* is a particularly dense and difficult work, even by Kantian standards. It is engaged with relatively technical problems in the foundations of the physical science of Kant's time, and, what is worse, it is structured in a forbidding quasi-mathematical style via "definitions" ("explications"), "propositions," "proofs," "remarks," and so on. I believe, nonetheless, that this little treatise of 1786 is one of the most important works in Kant's large corpus, and, in particular, that it is impossible fully to understand the theoretical philosophy of the critical period without coming to terms with it. Kant himself addresses the question of the place of the *Metaphysical Foundations* within the critical system most explicitly in his Preface, and so my discussion of this issue will also serve as my initial reading of the Preface.¹

¹ As explained in my Preface, I shall discuss the Preface to the *Metaphysical Foundations* in two stages: here in the Introduction and then (retrospectively) in the Conclusion.

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CRITIQUE OF PURE REASON

The *Metaphysical Foundations* is centrally implicated in the important changes Kant made between the first and second editions of the *Critique*. In January of 1782, soon after the appearance of the first edition, a highly critical review contributed by Christian Garve and revised by the editor J. G. Feder was published in the *Göttinger Anzeigen von gelehrten Sachen*.² This review, as is well known, maintained that what Kant had produced is simply a new version of an old doctrine – a version of psychological or subjective Berkeleyan idealism. Kant, not surprisingly, was displeased, and his very next statement of the critical philosophy, in the *Prolegomena*, was clearly intended, at least in part, to answer this charge of subjective idealism. Indeed, the appendix to the *Prolegomena*, “On what can be done to make metaphysics as a science actual,” is almost exclusively devoted to a reply to the Garve–Feder review.

Kant attempts, in particular, conclusively to differentiate his view from Berkeley's by focussing on the critical doctrine of space (together with that of time):

I show, by contrast [with Berkeley], that, in the first place, space (and also time, which Berkeley did not consider) together with all of its determinations can be cognized by us a priori, because it, as well as time, inheres in us prior to all perception, or experience, as pure form of our sensibility, and makes possible all sensible intuitions and therefore all appearances. It follows [in the second place] that, since truth rests on universal and necessary laws, as its criterion, experience for Berkeley can have no criterion of truth – for the appearances (for him) had nothing a priori at their basis, from which it then followed that they are nothing but mere semblance [*Schein*]. By contrast, for us space and time (in combination with the pure concepts of the understanding) prescribe their law a priori to all possible experience, which, at the same time, yields the secure criterion of truth for distinguishing, within experience, truth from semblance. (4, 375)

Kant continues by asserting that his “so-called (properly critical) idealism is thus of an entirely peculiar kind, in such a way, namely, that it overturns the customary [idealism], [so] that through it all a priori cognition, even that of geometry, first acquires objective reality,” and he therefore begs permission to call his philosophy “formal, or better critical idealism, in order to distinguish it from the dogmatic [idealism] of Berkeley and the skeptical [idealism] of Descartes” (4, 375).

² A translation can be found in Kant (2004a).

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The second edition of the *Critique* appeared four years later. Here Kant extensively revised some of the most important (and most difficult) chapters of the book: the transcendental deduction of the categories, the paralogisms of pure reason, and the system of the principles of pure understanding. The former two chapters are completely rewritten. In the case of the principles chapter the revisions are not as extensive, but Kant did add two entirely new sections: the famous refutation of idealism and a general remark to the system of principles, which, among other things, is intended “to confirm our previous refutation of idealism” (B293).³ Moreover, Kant also substantively revised the structure of the transcendental aesthetic by separating two distinct lines of argument with respect to both space and time: a “metaphysical exposition,” which articulates the synthetic a priori character of the representation in question (space or time) by elucidating “what belongs to it” in so far as it is “*given a priori*” (B37–38), and a “transcendental exposition,” which demonstrates the synthetic a priori character of the representation in question by showing that only on this assumption is a certain body of assumed synthetic a priori knowledge possible (B40).

In the case of the transcendental exposition of the concept of space, of course, the synthetic a priori science in question is geometry (B40): “a science that determines the properties of space synthetically and yet a priori.” It is important to note, however, that the science of geometry thereby enables us (synthetically and yet a priori) to determine the objects of outer intuition – the appearances of outer sense – as well (B41):

Now how can an outer intuition dwell in the mind that precedes the objects themselves and in which the concept of the latter can be a priori determined? Obviously not otherwise except in so far as it has its seat merely in the subject, as its formal constitution to be affected by objects, and thereby to acquire an *immediate representation*, i.e., *intuition*, of them, and thus only as the form of outer sense in general.

Thus Kant’s argument for transcendental or “formal” idealism here depends, just as much as in the *Prolegomena*, on the idea that the synthetic

³ The text of the refutation of idealism begins by echoing the remarks on “formal” idealism (in connection with both Berkeley and Descartes) from the appendix to the *Prolegomena* (B274):

Idealism (I mean *material* [idealism]) is the theory that declares the existence of objects in space outside us to be either merely doubtful and *indemonstrable* or false and *impossible*. The *first* is the *problematic* [idealism] of *Descartes*, which declares only a single empirical assertion – namely, *I think* – to be indubitable; the *second* is the *dogmatic* [idealism] of *Berkeley*, which declares space, and with it all things to which it attaches as an inseparable condition, to be something impossible in itself, and therefore also [declares] the things in space to be mere figments of the imagination.

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a priori representation of space, along with the synthetic a priori science of geometry, plays a crucial role in making experience or *empirical* knowledge first possible.⁴

In the general remarks to the transcendental aesthetic (§8) Kant clinches his argument for transcendental idealism – so as to make its certainty “completely convincing” – by choosing “a case whose validity can become obvious” (A46/B63–64). This, once again, is the case of space and geometry, which (Kant adds in the second edition) “can serve to clarify what has been adduced in §3 [namely, the transcendental exposition]” (B64). And the point, in harmony with §3, is that only on the assumption of transcendental idealism is synthetic a priori geometrical knowledge of the objects of outer intuition possible (A48/B66): “If space (and thus also time) were not a mere form of your intuition, which contains a priori conditions under which alone things can be outer objects for you, without which subjective conditions they are nothing in themselves; then you could a priori constitute nothing at all about outer objects synthetically.” Geometry is a synthetic a priori science, in other words, precisely because our pure intuition of space is a subjectively given a priori condition for all appearances or objects of experience.⁵

The changes introduced in the second edition of the *Critique*, following the *Prolegomena*, are intended further to delimit Kant's view from subjective idealism. They do this, in particular, by emphasizing the importance of the representation of space (and thus geometry) in Kant's system, together with the circumstance that what Kant means by

⁴ This point illuminates, and is illuminated by, what Kant says in the aesthetic prior to the transcendental exposition. The introduction to the metaphysical exposition states (A22/B37): “By means of outer sense (a property of our mind) we represent objects to ourselves as outside of us, and all of these *in space*. Therein is their figure, magnitude, and relation to one another determined, or determinable.” The conclusion of the first argument then asserts (A23/B38): “Therefore, the representation of space cannot be obtained from the relations of outer appearance through experience; rather, this outer experience is itself only possible in the first place by means of the representation in question.” The conclusion of the second argument similarly asserts (A24/B38): “Space is a necessary a priori representation, which lies at the basis of all outer intuition ... It must therefore be viewed as the condition of the possibility of appearances, not as a determination depending on them, and is an a priori representation, which necessarily lies at the basis of outer appearances.”

⁵ Kant makes this explicit in the immediately following (and concluding) sentence (A48–49/B66):

It is thus indubitably certain, and not merely possible, or even probable, that space and time, as the necessary conditions of all (outer and inner) experience, are merely subjective conditions of all our intuition, in relation to which therefore all objects are mere appearances and not things in themselves given in this manner, about which much a priori can also be said in reference to what pertains to their form, but never the least about the things in themselves that may lie at the basis of these appearances.

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“appearances” includes – indeed centrally includes – material physical bodies located outside me in space. This is especially true of the refutation of idealism, of course, which argues that even my knowledge of my own mental states in inner sense is only possible on the basis of my perception (my *immediate* perception) of external material bodies located outside my mind in outer sense. And the more general point, as we have seen, is that space and geometry play a privileged constitutive role in making experience or empirical knowledge first possible. In terms of the constitution of *experience*, therefore, outer sense is prior to inner sense. As Kant explains in the preamble to the refutation of idealism, his proof aims to show “that even our *inner* experience (which was not doubted by Descartes) is only possible under the presupposition of *outer* experience” (B275).⁶

Kant explains in the Preface to the *Metaphysical Foundations* that the task of this work is to delineate the a priori principles governing what Kant calls the *doctrine of body* – which depends, more generally, on “the form and the principles of outer intuition” (4, 478). Kant begins the Preface by asserting (467) that nature, in its “*material* meaning,” “has two principal parts, in accordance with the principal division of our senses, where the one contains the objects of the *outer* senses, the other the object of *inner* sense.” “In this meaning,” Kant continues, “a twofold doctrine of nature is possible, the *doctrine of body* and the *doctrine of the soul*, where the first considers *extended* nature, the second *thinking* nature” (467). (Note here the clear echo of Descartes.) At least in principle, therefore, two different branches of the metaphysics of nature are possible – two different species (470) of “*special* metaphysical natural science (physics or psychology), in which the above transcendental principles [of the first *Critique*] are applied to the two species of objects of our senses.”⁷ It turns out, however,

⁶ As Kant explains in the aesthetic, there is another sense in which time, as the form of inner sense, is prior to space (A34/B50):

Time is the formal a priori condition of all appearances in general. Space, as the pure form of all outer intuition is, as a priori condition, limited merely to outer appearances. By contrast, because all representations, whether they have outer things as object or not, nevertheless belong in themselves, as determinations of the mind, to our inner state; and because this inner state belongs under the formal condition of inner intuition, and thus to time; [it follows that] time is an a priori condition of all appearances in general – the immediate condition of inner appearances (of our soul) and precisely for this reason the mediate condition of outer appearances as well.

This, however, is a priority with respect to intuition or appearance, not a priority with respect to experience. Thus Kant also asserts, in the second edition aesthetic, that “within [inner intuition] the representations of the *outer senses* constitute the proper material with which we occupy our mind” (B67).

⁷ More precisely, according to the paragraph of which this sentence is the conclusion, there is a more general species of the metaphysics of nature (general metaphysics or transcendental

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that only the special metaphysics of *corporeal* nature can serve to ground a genuine science.

Kant articulates the reason for this in the following paragraph, which begins with the statement (470) that “in any special doctrine of nature there can be only as much *proper* science as there is *mathematics* to be found therein” and concludes with the claim that “since in any doctrine of nature there is only as much proper science as there is a priori knowledge therein, a [special] doctrine of nature will contain only as much proper science as there is mathematics capable of application there” (470).⁸ Kant goes on to argue that chemistry (unlike pure physics or the mathematical theory of motion) will “only with great difficulty” ever become a proper science (470–71) and that the situation is even worse in psychology:

Yet the empirical doctrine of the soul must remain even further from the rank of a properly so-called natural science than chemistry. In the first place, because mathematics is not applicable to the phenomena of inner sense and their laws, the only option one would have would be to take the *law of continuity* in the flux of inner changes into account – which, however, would be an extension of cognition standing to that which mathematics provides for the doctrine of body approximately as the doctrine of the properties of the straight line stands to the whole of geometry. For the pure intuition in which the appearances of the soul are supposed to be constructed is *time*, which has only one dimension ... Therefore, the empirical doctrine of the soul can never become anything more than an historical doctrine of nature, and, as such, a natural doctrine of inner sense which is as systematic as possible, that is a natural description of the soul ... This is also the reason for our having used, in accordance with common custom, the general title of natural science for this work, which actually contains the principles of the doctrine of body, for only to it does this title belong in the proper sense, and so no ambiguity is thereby produced. (471)

In other words, since geometry cannot apply in any substantive way to the object of inner sense, there can be no proper science of this object (the soul). Consequently, there can be no metaphysical foundations of natural science applying specifically to the soul – no Kantian explanation of how our supposed knowledge of the soul is grounded in a priori principles governing both concepts and intuitions. Our empirical knowledge of the contents of inner sense, to the extent that we have such knowledge, rather presupposes (like all empirical knowledge or experience in general) “the form and the principles” of *outer* intuition.

philosophy) of which the two species of special metaphysics are *subspecies*. I shall return to this paragraph below.

⁸ I shall return below to the difficult argument on behalf of these claims presented in the body of the paragraph.

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To see the connection between this argument and the refutation of idealism articulated in the second edition of the *Critique*, it is helpful to look at the argument Kant provides in the general remark to the system of principles as confirmation of the refutation of idealism. In this later argument Kant has already stated (B288) that there is something “remarkable” in the circumstance “that we cannot comprehend the possibility of things in accordance with *the mere category*, but must rather always have an intuition at hand in order to establish the objective reality of the pure concept of the understanding.” He now goes further by emphasizing the need for specifically *spatial* intuitions:

It is even more remarkable, however, that, in order to understand the possibility of things in accordance with the categories, and thus to verify the *objective reality* of the latter, we require not merely intuitions, but always even *outer intuitions*. If, for example, we take the pure concepts of *relation*, we find, first, that in order to supply something *permanent* in intuition corresponding to the concept of *substance* (and thereby to verify the objective reality of this concept), we require an intuition *in space* (of matter), because space alone is determined as permanent, but time, and thus everything in inner sense, continually flows. (B291)

This argument is clearly reminiscent of that of the refutation of idealism.⁹

Unlike in the refutation, however, Kant now elaborates the argument in terms of all three categories of relation: substance, causality, and community. After his discussion of the category of causality (to which I shall return below), Kant describes (B292) the “proper ground” for the necessity of specifically outer intuition in this case as the circumstance “that all alteration presupposes something permanent in intuition, in order even to be perceived as alteration itself, but in inner sense no permanent intuition at all is to be found.” The point of the remark is then summed up as follows (B293–94): “*This entire remark is of great importance*, not only in order to confirm our previous refutation of idealism, but even more so [later], when we will speak of *self-knowledge from mere inner consciousness* and the determination of our nature without the assistance of outer empirical intuitions, in order to indicate the limits of the possibility of such knowledge.” Kant thereby points forward to the discussion of the

⁹ This becomes especially clear in the second remark to the refutation of idealism, where Kant asserts (B278) that “we have absolutely *nothing permanent*, which could underlie the concept of a *substance*, as intuition, *except merely matter*, and even this permanent is not derived from outer experience but is rather presupposed a priori as a necessary condition of all *determination of time*, and thus as a determination of *inner sense* through *the existence of outer things* with respect to *our own existence*.”

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(second edition) paralogisms, as well as backward to the refutation of idealism.

But there is an important passage towards the end of the Preface to the *Metaphysical Foundations* of which this discussion in the general remark is a clear echo. After carefully distinguishing between general metaphysics or transcendental philosophy and the special metaphysics of (corporeal) nature, Kant continues:

It is also indeed very remarkable (but cannot be expounded in detail here) that general metaphysics, in all instances where it requires examples (intuitions) in order to provide meaning for its pure concepts of the understanding, must always take them from the general doctrine of body, and thus from the form and the principles of outer intuition; and, if these are not exhibited completely, it gropes uncertainly and unsteadily among mere meaningless concepts ... [here] the understanding is taught only by examples from corporeal nature what the conditions are under which such concepts can alone have objective reality, that is, meaning and truth. And so a separated metaphysics of corporeal nature does excellent and indispensable service for *general* metaphysics, in that the former furnishes examples (instances *in concreto*) in which to realize the concepts and propositions of the latter (properly speaking, transcendental philosophy), that is, to give a mere form of thought sense and meaning. (478)

Where this matter *is* “expounded in detail,” it appears, is precisely the general remark added to the second edition of the *Critique*. And there is thus a significant connection indeed, I believe, between the argument concerning the priority of outer sense for experience developed in the refutation of idealism and the argument we have been considering from the Preface to the *Metaphysical Foundations* – according to which only the metaphysics of *corporeal* nature is capable of grounding a genuine natural science.¹⁰

In order properly to appreciate this point, however, we need also to observe that the a priori experience-constituting principles derived from “the form and the principles of outer intuition” include not only spatial geometry but also what Kant variously calls the “pure” or “general” or “mathematical” *doctrine of motion* [*Bewegungslehre*]. Indeed, when Kant, in the Preface, comes to describe how the *Metaphysical Foundations* will actually carry out the program of a special metaphysics of corporeal

¹⁰ Although there is such a connection, I believe, between the argument of the Preface to the *Metaphysical Foundations* and the refutation of idealism, there remain crucially important differences between the two. I shall return to a consideration of these important differences (which are closely related, in turn, to the more general differences, for Kant, between the perspectives of the *Metaphysical Foundations* and the first *Critique*) in the Conclusion. I am especially indebted to illuminating conversations with Daniel Warren for a better appreciation of these differences.

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nature, he begins by placing this doctrine of motion at the basis (476–77): “The basic determination of something that is to be an object of the outer senses had to be motion, because only thereby can these senses be affected. The understanding traces back all other predicates of matter belonging to its nature to this one, and so natural science is either a pure or applied *doctrine of motion* throughout.”¹¹ Kant continues by stating (477) that “[t]he *metaphysical* foundations of natural science are therefore to be brought under *four* chapters” – arranged in accordance with the table of categories – where each chapter adds a new aspect or “determination” to the concept of motion. In particular, the first chapter or Phoronomy begins by defining or explicating the concept of matter – that which is to be “an object of the outer senses” – as the *movable in space* [*das Bewegliche im Raume*]. In addition, Kant makes it clear at the end of the Preface that the doctrine of motion he has in mind here is a “*mathematical* doctrine of motion [*mathematische Bewegungslehre*]” (478, emphasis added).

According to the transcendental exposition of the concept of *time* added to the second edition of the *Critique* (§5) it is precisely this mathematical theory that stands to the concept of time as geometry stands to the concept of space (B48–49):

Here I may add that the concept of alteration and, along with it, the concept of motion (as alteration of place) is possible only in and through the representation of time: so that, if this representation were not an a priori (inner) intuition, no concept, whatever it might be, could make an alteration – i.e., the combination of contradictorily opposed predicates (e.g., the being and not-being of one and the same thing at one and the same place) – conceivable. Only in time can two contradictorily opposed determinations in one thing be met with, namely, *successively*. Therefore, our concept of time explains as much synthetic a priori knowledge as is set forth in the general doctrine of motion [*allgemeine Bewegungslehre*], which is by no means unfruitful.¹²

As we shall see, the *general doctrine of motion* to which Kant refers here (and which, he laconically remarks, “is by no means unfruitful”) is the mathematical theory of motion Newton develops in the *Principia*.

¹¹ It is presumably the *pure* doctrine of motion that figures in what Kant calls *pure* natural science. I shall discuss Kant’s cryptic argument for the priority of motion here (“because only thereby can these senses be affected”) in my chapter on the Phoronomy below.

¹² The passage corresponding to the transcendental expositions of space and time in §10 of the *Prolegomena* reads (4, 283): “Geometry takes as its basis the pure intuition of space. Arithmetic produces even its concepts of number by the successive addition of units in time – above all, however, pure mechanics can produce its concepts of motion only by means of the representation of time.” Here “pure mechanics [*reine Mechanik*]” appears to correspond to the “general doctrine of motion [*allgemeine Bewegungslehre*]” in the second edition of the *Critique*.

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Kant's emphasis on the concept of *succession* in the transcendental exposition suggests that the general doctrine of motion is important not only in the transcendental aesthetic but also in the transcendental analytic as well – and, in particular, that it is intimately connected with the concept of causality.¹³ This suggestion is confirmed in the discussion of causality in the general remark to the system of principles that immediately follows the treatment of the concept of substance (the passage at B29I quoted above):

Second, in order to exhibit *alteration*, as the intuition corresponding to the concept of *causality*, we must take motion, as alteration in space, for the example. Indeed, it is even the case that we can make alteration intuitive to ourselves solely in this way, as no pure understanding can conceive its possibility. Alteration is the combination of contradictorily opposed determinations in the existence of one and the same thing. How it may now be possible that an opposed state follows from a given state of the same thing is not only inconceivable to any reason without example, but is not even understandable without intuition – and this intuition is the motion of a point in space, whose existence in different places (as a sequence of opposed determinations) alone makes alteration intuitive to us in the first place. For, in order that we may afterwards make even inner alterations intuitive, we must make time, as the form of inner sense, intelligible figuratively as a line – and inner alteration by the drawing of this line (motion), and thus the successive existence of our self in different states by outer intuition. (B29I–92)

Kant here, once again, suggests a connection between the concept of alteration (and the concept of causality) and the refutation of idealism. Now, however, it appears that a deeper ground for the priority of space in the constitution even of inner experience is that an a priori basis for specifically *temporal* experience depends on the general doctrine of motion – where the concept of motion “unites” time with space (A41/B58).¹⁴

¹³ The *schema* of the concept of causality, for Kant, consists in “the succession of the manifold, in so far as it is subject to a rule” (A144/B183).

¹⁴ I shall return to the full passage below. The idea that time might require an outer (spatial) representation is introduced as early as the first edition transcendental aesthetic (A33/B50):

[P]recisely because this inner intuition [that is, time] provides no figure, we seek to make up for this lack by analogies, and we represent the temporal sequence by a line progressing to infinity, in which the manifold constitutes a series that is of only one dimension, and we infer from the properties of this line to all the properties of time – except in the case of the single [property] that all parts of the former are simultaneous, but those of the latter are always successive.

In §24 of the second edition transcendental deduction Kant introduces the idea of an “outer *figurative* representation of time” explicitly (B154, emphasis added), states the need for this representation in much stronger terms, and is also explicit that the representation in question essentially involves motion (and therefore succession) (B156, emphases added): “[W]e can make time representable to ourselves *in no other way* than under the image of a line, in so far as we *draw* it, without which mode of presentation we could in no way cognize the unity of its measure or dimension [*Einheit ihrer Abmessung*].” Kant immediately goes on to indicate a connection between this point and the argument of the refutation of idealism that is yet to come.