

To appear in: A. Janiak, ed., *Space: A History* (OXFORD PHILOSOPHICAL CONCEPTS), Oxford University Press.

Submitted: September 28, 2013

Space in Kantian Idealism*

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The concept of space is crucially involved in Kant's characteristic form of idealism, which he calls "transcendental" idealism. This doctrine, in the present context, can be thought of as consisting of four interrelated theses. First, the representation of space is a pure or a priori *intuition* belonging to the faculty of sensibility, not a *concept* belonging to the understanding or intellect. Second, the pure intuition of space is the a priori *form* of our perception of outer objects or bodies. Third, this same pure intuition is the primary source of the (synthetic) a priori science of geometry. Fourth, space, together with the outer objects (bodies) perceived within it, has no other reality apart from our pure form of (outer) intuition; neither space nor bodies exist *in themselves* independently of our subjective (characteristically human) form of (outer) perception.¹

This doctrine, especially the fourth thesis, flies in the face of common sense. What could it possibly mean to say that space—the very same space in which we, along with all other physical bodies, live and move and have our being—has no real existence apart from the subjective constitution of the human mind? The main point of the present essay is that Kant's conception of space (and thus his transcendental idealism) can only be properly understood against the background of what he took to be the central intellectual debate of the eighteenth century between Newton (and his follows) and Leibniz (and his followers). In the *Critique of Pure Reason* (1781/1787) Kant's principal arguments for transcendental idealism—with respect to space, on the one side, and the outer objects (bodies) contained within it, on the other—are found, respectively, in the Transcendental Aesthetic and the (First and Second) Antinomies. Both of these texts, I argue, should be read in relation to Kant's understanding of the debate between Newtonians and Leibnizeans.

The Transcendental Aesthetic begins by posing the main question to be addressed:

* I am indebted to a discussion at the Franklin Humanities Institute at Duke in April 2013 organized by Andrew Janiak for the main participants in the Oxford Philosophical Concepts volume. I would like to thank all of the participants in this discussion, and I am especially grateful to Robert DiSalle, Gary Hatfield, and Edith Sylla for helpful comments on my contribution.

¹ For Kant there are two forms of (human) sensibility, space and time; the first is the form of what he calls *outer* sense, the second of what he calls *inner* sense. Although the focus of this essay is primarily on the former, the relationship between space and time will turn out to be centrally important as well.

What now are space and time? Are they actual beings? Are they only determinations or even relations of things, but still such as would also pertain to them in themselves, even if they were not intuited? Or are they such as to attach only to the form of intuition alone, and thus to the subjective constitution of our mind, without which these predicates can be attributed to no things at all? (A23/B37-8)

It seems clear that Kant takes the first alternative to be Newtonian, the second to be Leibnizean, and the third to be his own. Kant takes these alternatives to be exclusive and exhaustive, so that eliminating the first two leaves only the Kantian view still standing.²

One of the principal arguments of the Aesthetic appeals to the synthetic a priori status of the science of geometry. Our knowledge of geometry, Kant assumes, is both a priori and non-analytic. So neither logic nor conceptual analysis can explain the character of this knowledge. Our representation of space, therefore, cannot be a concept, and so, for Kant, it can only be an intuition—which, since the knowledge in question is (assumed to be) a priori, can only be a *pure* intuition pertaining to the form of our outer perception.³ The clearest presentation of this argument occurs in the Transcendental Exposition of Space added to the Aesthetic in the second (1787) edition:

Geometry is a science that determines the properties of space synthetically and yet a priori. What must the representation of space then be in order that such a cognition from it may be possible? It must originally be intuition; for no propositions can be inferred from a mere concept that go beyond the concept, which nevertheless takes place in geometry (Introduction V). But this intuition must be found in us a priori, i.e., prior to all perception of an object, and must be pure, not empirical intuition. For geometrical propositions are all apodictic, i.e., bound up with the consciousness of their necessity: e.g., space has only three dimensions; such propositions, however, cannot be empirical or judgements of experience, nor can they be inferred from them (Introduction II). (B40-1)

And the obvious conclusion, for Kant, is his own doctrine of transcendental idealism (B41): “Now how can an outer intuition dwell in the mind that precedes the objects

² This reading of the three alternatives (Newtonian, Leibnizean, and Kantian) is not particularly controversial; we shall find strong confirmation for it below.

³ Here Kant is depending on a fundamental distinction between the form and matter of intuition (A20/B34): “I call that in the appearance which corresponds to sensation its *matter*, but that which brings it about that the manifold of appearances can be ordered in certain relations I call the *form* of appearance. Since that within which sensations can alone be ordered and arranged in a certain form cannot itself be sensation in turn, the matter of all appearance, to be sure, is only given to us a posteriori, but its form must already lie ready for it in the mind a priori and can therefore be considered separately from all sensation.”

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.”

This conclusion, however, has seemed far from obvious to many commentators, extending back to Kant’s contemporaries. For it seems that, even if we accept all of Kant’s premises, the argument establishes only the epistemological claim that the primary source of geometrical knowledge (in both pure and applied geometry) is our pure form of outer intuition. It does not yet establish the ontological claim that space just is the pure form of our outer intuition and (together with the outer objects perceived therein) has no existence in itself independently of this form. There remains a large gap, in other words, between our representation of space and space itself, and it seems that Kant has simply neglected the alternative that space might be both the form of our outer intuition and the form of the genuinely real (outer) objects that exist independently of the human mind.⁴ In order fully to understand why Kant thought that his conclusion followed “obviously” from his premises, we must better appreciate the sense in which Kant took the three alternatives with which he began (A23/B37-8) to be exclusive and exhaustive.⁵

Further light is shed on the transition from epistemological to ontological claim by what Kant says later in the Aesthetic. The crucial passage begins as follows:

Those who assert the absolute reality of space and time, whether they assume this as subsistent or only as inherent, must be in conflict with the principles of experience themselves. For, if they include themselves within the first (which is commonly the party of the mathematical investigators of nature), then they must assume two eternal and infinite non-things [*Undinge*] subsisting in themselves (space and time), which are there (without there being anything actual), only in order to contain all actuality within themselves. If they choose the second party (that of some metaphysical students of nature), for whom space and time are taken to be relations between appearances (next to or after one

⁴ For discussion of this famous “neglected alternative” objection and its history see Allison (1983/2004, chapter 5, § C)

⁵ There is a suggestion of these alternatives at the very end of the argument of the Transcendental Exposition (B41): “Thus only our explanation makes the *possibility of geometry* conceivable as a synthetic a priori cognition. Any mode of explanation that does not provide this, even if it may have the appearance of being similar to ours, can therefore be distinguished from ours with the highest degree of certainty.” The relevant (possible) explanations, as we shall see, are provided by the Newtonian, Leibnizean, and Kantian alternatives.

another), abstracted from experience, although in the abstraction represented confusedly, then they must contest the a priori validity of mathematical doctrines in relation to actual things (e.g., in space), or at least contest their apodictic certainty, in so far as this can in no way take place a posteriori; and the a priori concepts of space and time, according to their view, are only creatures of the imagination, whose source must actually be sought in experience, from whose abstracted relations the imagination has made something, which indeed contains the generality of [these relations], but which cannot take place without the restrictions that nature has connected with them. (A39-40/B56-7)

We know from Kant's earlier works—especially the *Physical Monadology* (1756) and *Inaugural Dissertation* (1770)—that by “mathematical investigators of nature” he means Newtonians and by “metaphysical students” he means Leibnizeans.⁶ So the parties in question have now been explicitly identified, along with the two alternatives to Kant's own position described at the beginning of the Aesthetic.⁷

Kant's position emerges as the only remaining alternative to the Newtonian and Leibnizean positions in the remainder of our passage:

The first gain this much, that they make the field of appearances free for mathematical assertions. On the other hand, they confuse themselves very much by precisely these conditions when the understanding pretends to extend beyond this field. The latter gain much in the latter respect, namely, the representations of space and time do not get in the way when they wish to judge of objects not as appearances but merely in relation to the understanding; however, they can neither give an account of the possibility of a priori mathematical cognitions (in so far as they lack a true and objectively valid a priori intuition) nor bring empirical propositions into necessary agreement with these [mathematical] assertions. In our theory of the true constitution of these two original forms of sensibility both difficulties are remedied. (A40-1/B57-8)

⁶ For discussion of these earlier works in relation to our passages from the Aesthetic see Friedman (2013, pp. 11-17).

⁷ Those who assert the “absolute reality” of space and time are just those who deny transcendental idealism. And there are exactly two ways in which such “absolute reality” may be asserted (of space and time): either as “actual beings” (A23/B37)—i.e., as “subsistent”—or as “determinations or even relations of things” (ibid.)—i.e., as “inherent” (in so far as “determinations or even relations” must inhere in substances).

Kant's position not only explains the special character of our mathematical knowledge, it also overcomes the overwhelming difficulties faced by the only extant alternatives. Yet there are a number of points in this passage that are by no means immediately clear.

It is clear enough why the Newtonians “make the field of appearances free for mathematical assertions” (A40/B57). For their absolute space is in itself pure and entirely empty of appearances (i.e., physical bodies), so that its mathematical properties can in principle be known a priori and with full mathematical precision.⁸ But how exactly do they “confuse themselves very much . . . when the understanding pretends to extend beyond this field [of appearances]” (ibid.)? Kant formulates his point more explicitly in a comment added to the second addition towards the end of the Aesthetic:

In natural theology, where one thinks an object that is not only no object of sensible intuition for us, but cannot even be an object of sensible intuition for itself, one takes care to remove the conditions of space and time from all of its intuition (for all of its cognition must be intuition and not *thought*, which is always a manifestation of limitations). But with what right can one do this, if one has previously made both into forms of things in themselves—and, indeed, into forms which, as a priori conditions of the existence of things, even remain when one has annihilated the things themselves? (For, as conditions of all existence in general, they must also be conditions for the existence of God.) There is therefore no alternative, if one does not pretend to make them into objective forms of all things, except to make them into subjective forms of our outer and inner mode of intuition. [This kind of intuition] is called sensible, because it is *not original*—i.e., it is not such that the existence of objects of intuition is itself given through it (which, as far as we can comprehend, can only pertain to the primordial being), but it depends on the existence of the objects, and is thus only possible in so far as the representative faculty of the subject is affected by them. (B71-2)⁹

⁸ In other words, Newtonian absolute space pertains to the *form* rather than the *matter* of the bodies (Kantian outer appearances) contained within it; its structure, therefore, is in principle capable of a priori cognition in Kant's sense (note 3 above).

⁹ God's knowledge must be intuitive, for Kant, because only this kind of knowledge is *immediate*. Discursive or conceptual thought, by contrast, is always *mediate*, in so far as it depends on matter given from without (i.e., in intuition) for its content. If space had absolute reality in the Newtonian sense, therefore, it would be a (transcendentally) objective form of the existence of all things. But, since this leads to absurd consequences (the existence of God in space), only the Kantian alternative remains. Note that here—and in the related passage earlier in the Aesthetic (A39-41/B56-8)—Kant does not object to the Newtonian conception on the grounds that if space were (transcendentally) objective and independent of the human mind a priori cognition of it would be problematic; he saves this kind of objection instead for the Leibnizean conception.

Here the primary “confusions” at issue arise from the Newtonian doctrine of divine omnipresence, which is indeed very hard to avoid if one assumes that space and time are “two eternal and infinite non-things subsisting in themselves . . . , which are there (without there being anything actual), only in order to contain all actuality within themselves” (A39/B56)—i.e., if one attributes to space and time the attributes of God’s immensity and eternity.¹⁰

Kant’s description of the Leibnizean view, however, is considerably more puzzling. Are not the fundamental entities, on this view, non-spatio-temporal simple substances or monads, such that space and time (as ideal “well-founded phenomena”) are then possible as arising from the purely intellectual relations of coexistence and (internal) causation holding among these substances and between their own (internal) states? And, if so, why should this view be understood as concerned with “relations between *appearances* . . . , abstracted from experience, although in the abstraction represented confusedly” (A40/B56-7; emphasis added)?¹¹ Why, accordingly, must the Leibnizeans “contest the a priori validity of mathematical doctrines in relation to actual things (e.g., in space), or at least contest their apodictic certainty, in so far as . . . the a priori concepts of space and time, according to their view, are only creatures of the imagination, whose source must actually be sought in experience” (A40/B57)?¹²

The specific target of Kant’s criticism emerges more clearly in his remark to the antithesis of the Second Antinomy—which concerns the infinite divisibility of matter in space:

¹⁰ See the General Scholium added to the second edition of the *Principia* (1999, p. 941): “[The true God] is not eternity and infinity, but eternal and infinite; he is not duration and space, but he endures and is present. He endures always and is present everywhere, and by existing always and everywhere he constitutes duration and space.” The Newtonian doctrine of divine omnipresence is a central point of contention in the Leibniz-Clarke correspondence. For an extended discussion of the relationship between Kant’s transcendental idealism and this Newtonian doctrine see Friedman (2009).

¹¹ One of the best-known passages in the Leibniz-Clarke correspondence, § 47 of Leibniz’s Fifth Letter, describes how something like the Newtonian conception of absolute space arises by abstraction from our observation of the relative positions and motions of bodies. What is explained there, however, is not geometrical space but rather space as a dynamical framework for describing the motions and interactions (forces) of bodies; it therefore concerns the relationship between space and time. This is important, as I shall explain below, because it turns out that the most fundamental difference between Leibniz’s idealism and Kant’s concerns the character of the dynamical framework in question.

¹² On the view that space and time arise from the purely intellectual relations of coexistence and causation, holding among ultimate simple substances conceived purely intellectually, the system of relations in question would constitute a formal rather than material element of cognition in Kant’s sense. It would therefore be capable, in principle, of a priori cognition. Kant could (and would) object that such a system cannot explain the (assumed) *synthetic* a priori status of our geometrical cognition; it is important to appreciate, however, that he does not make this objection here.

Against this proposition of the infinite division of matter, the ground of proof of which is purely mathematical, the *monadists* have brought forward objections—which, however, already make them objects of suspicion, in that they are not willing to grant that the clearest mathematical proofs are insights into the constitution of space, in so far as it is in fact the formal condition of the possibility of all matter, and they rather view [these proofs] as only inferences from abstract yet arbitrary concepts, which cannot be applied to real things. . . . If one listens to [these monadists], then one would have to think, aside from the mathematical point, which is not a part but merely the limit of a space, also physical points, which are indeed also simple, but have the advantage, as parts of the space, of filling it through their mere aggregation. (A439/B467)

These physical points—or physical monads—are thus simple and elementary material substances. As material substances, they are what Kant himself calls *bodies* and thus what Kant himself calls *appearances*. According to precisely the argument of the Second Antinomy, however, all such bodies in the Kantian sense must be infinitely divisible, since they are only possible, for Kant, within our pure intuition of space—which, in turn, is necessarily infinitely divisible in accordance with the “clearest mathematical proofs” (A439/B467).

For the monadists in question, by contrast, the ultimate simple substances or physical points are prior to the space that they fill. They are then supposed to *constitute* this space “through their mere aggregation” (A440/B468). Here, however, the monadists that Kant is targeting run squarely into the problem of the composition of the continuum and, more specifically, into Zeno’s metrical paradox of extension. According to this paradox, one can never attain an extended region of space by composing any number of unextended simple elements (points), not even an infinite number of such elements. The only way out, therefore, would be to take the elements out of which the space filled by a body is to be composed as merely very small extended regions (rather than unextended points) and, as a consequence, to deny the infinite divisibility of (physical) space. For one would otherwise run into the second horn of Zeno’s metrical paradox, according to which an infinite number of extended (finite) elements could never compose a finite extended region (a body). Thus, the monadists that Kant is targeting here not only take the points out of which (physical) space is composed to be what Kant calls appearances—

thereby making our knowledge of space a posteriori. They even go so far as to deny the evident mathematical proposition of infinite divisibility—thereby “contest[ing] the a priori validity of mathematical doctrines in relation to actual things” (A40/B57).¹³

Vincenzo De Risi has argued in detail that the monadists in question in the remark to the antithesis of the Second Antinomy include later representatives of the so-called “Leibnizean-Wolffian Philosophy” but not Leibniz himself.¹⁴ Indeed, Kant is quite explicit, in the remark to the thesis of the Second Antinomy, that the monadists in question do not include Leibniz:

I speak here only of the simple, in so far as it is necessarily given in the composite, in that the latter can be resolved into them as its constituents. The proper meaning of the word *Monas* (according to Leibnizean usage) should only extend to that simple which is *immediately* given as simple substance (e.g., in self-consciousness), and not as element of the composite—which one could better call the atom. And, since I want only to prove [the existence of] simple substances in relation to the composite, as its elements, I could call the thesis of the second antinomy transcendental *atomism*. However, because this word has already long been used for the designation of a particular mode of explaining corporeal appearances (*molecularum*), and therefore presupposes empirical concepts, [the thesis] may be called the dialectical principle of *monadology*. (A440-2/B468-70)¹⁵

Kant is clear, therefore, that properly Leibnizean monads are not to be conceived as physical points out of which bodies (together with the space that they fill) are supposed to be composed. They are rather mind-like—and therefore entirely non-spatial—simple beings, which are given (at least to themselves) in immediate self-consciousness. To be sure, both space and physical bodies in space are in some sense derivative from these beings as ideal well-founded phenomena. In no sense, however, are they composed out of such beings.

¹³ Zeno’s metrical paradox played an important role in eighteenth-century conceptions of space and matter more generally; for an illuminating treatment, including discussions of Kant and his contemporaries, see Holden (2004). Edith Sylla has emphasized that these same problems played a corresponding role in arguments that were developed within the Medieval Aristotelian-Scholastic tradition to the effect that the natures of real (physical) things cannot be characterized mathematically.

¹⁴ See De Risi (2007, pp. 301-14), which discusses the work of Christian Wolff, Georg Bilfinger, and Alexander Baumgarten in this connection. De Risi is particularly concerned to contrast Leibniz’s views on the composition of the continuum with those expounded in Wolff (1737).

¹⁵ De Risi considers this passage in the discussion just cited, along with the passages from the *Metaphysical Foundations of Natural Science* that I consider in the following pages.

It is even more striking, however, that when Kant treats the infinite divisibility of matter and space in the *Metaphysical Foundations of Natural Science* (1786), he not only distinguishes Leibniz from his Leibnizean-Wolffian followers but also explicitly appropriates him on behalf of Kantian idealism. In particular, in the second remark to the fourth proposition (demonstrating the infinite divisibility of material substance) of the Dynamics chapter Kant appeals to the argument of the Second Antinomy to resolve a conflict concerning infinite divisibility between the “geometer” and “metaphysician”:

One would therefore have to conclude either, in spite of the geometer, that *space is not divisible to infinity*, or, to the annoyance of the metaphysician, that *space is not a property of a thing in itself*, and thus that matter is not a thing in itself, but merely an appearance of our outer senses in general, just as space is the essential form thereof. But here the philosopher is caught between the horns of a dangerous dilemma. To deny the first proposition, that space is divisible to infinity, is an empty undertaking; for nothing can be argued away from mathematics by sophisticated hair-splitting. But viewing matter as a thing in itself, and thus space as a property of the thing in itself, amounts to the denial of this proposition. The philosopher therefore finds himself forced to deviate from this last proposition, however common and congenial to the common understanding it may be. (4, 506)

Thus the errors of the “metaphysician” need here to be corrected by the (transcendental) “philosopher”—i.e., by transcendental idealism.¹⁶

More interestingly, however, Kant proceeds to contrast the “metaphysical” view he is targeting with the views of a (not yet named) “great man”:

A great man, who has contributed perhaps more than anyone else to preserving the reputation of mathematics in Germany, has frequently rejected the presumptuous metaphysical claims to overturn the theorems of geometry concerning the infinite divisibility of space by the well-grounded reminder *that space belongs only to the appearance of outer things*; but he has not been understood. This proposition was taken to be asserting that space appears to us, though it is otherwise a thing, or relation of things, in itself, but that the mathematician considers it only as it appears. Instead, it should have been understood as saying that space is in no way a property that attaches in itself to

¹⁶ Note that Kant is perfectly clear that his transcendental idealism runs counter to common sense, but he takes himself to be “forced” into this position by (among other things) the argument of the Second Antinomy.

any thing whatsoever outside our senses. It is, rather, only the subjective form of our sensibility, under which objects of the outer senses—with whose constitution in itself we are not acquainted—appear to us, and we then call this appearance matter. Through this misunderstanding one went on thinking of space as a property also attaching to things outside our faculty of representation, but such that the mathematician thinks it only in accordance with common concepts, that is, confusedly (for it is thus that one commonly explicates appearance). And one thus attributed the mathematical theorem of the infinite divisibility of matter, a proposition presupposing the highest [degree of] clarity in the concept of space, to a confused representation of space taken as basis by the geometer—whereby the metaphysician was then free to compose space out of points, and matter out of simple parts, and thus (in his opinion) to bring clarity into this concept. (4, 507)

Thus it is clear, in particular, that the “metaphysician” in question is essentially the same as the representative of the Leibnizean-Wolffian philosophy targeted in the Second Antinomy (A439/B467)—and also, in appears, in the passage contrasting Newtonians and Leibnizeans in the Aesthetic (A39-41/B56-8).¹⁷

In the immediately following discussion Kant goes on to make it clear that the “great man” in question is none other than Leibniz himself:

The ground for this aberration lies in a poorly understood *monadology*, which has nothing at all to do with the explanation of natural appearances, but is rather an intrinsically correct *platonian* concept of the world devised by *Leibniz*, in so far as it is considered, not at all as object of the senses, but as thing in itself, and is merely an object of the understanding—which, however, does indeed underlie the appearances of the senses. . . . Therefore, Leibniz’s idea [*Meinung*], so far as I comprehend it, was not to explicate space through the order of simple beings next to one another, it was rather to set this order alongside space as corresponding to it, but as belonging to a merely intelligible world (unknown to us). Thus he asserts nothing but what has been shown elsewhere: namely, that space, together with the matter of which it is the form, does not contain the world of things in

¹⁷ It is clear that the “metaphysicians” targeted here are the same as those targeted in the remark to the antithesis of the Second Antinomy because of the emphasis in both passages on the infinite divisibility of space; moreover, according to the second passage just quoted (4, 507), the “metaphysician” goes on “to compose space out of points, and matter out of simple parts” (*ibid.*). The connection between the discussion in the *Metaphysical Foundations* and the corresponding discussion in the Aesthetic is that, in both, the space of the “metaphysician” is taken to attach to or be inherent in things in themselves, with the result that the representation of the “mathematician” becomes necessarily confused.

themselves, but only their appearance, and is itself only the form of our outer sensible intuition. (4, 507-8)

Thus Kant here depicts Leibniz—against the Leibnizean-Wolffian “metaphysician”—as a defender of the Kantian doctrine of transcendental idealism.¹⁸

There are indeed strong similarities between Leibniz’s idealism and Kant’s. Leibniz, like Kant, considers two essentially distinct classes of entities: purely intellectual beings or noumena and purely sensible beings or phenomena. Space, for Leibniz, together with the matter or physical bodies that appear within it, is an ideal well-founded phenomenon rather than an ultimate metaphysical reality; moreover, its phenomenal status depends essentially on the perceptual relationships among the mind-like simple substances that constitute ultimate reality, as each such monad mirrors all the others from its own (perceptual) point of view. There is also no doubt that Kant’s formulation of transcendental idealism is deeply indebted to his assimilation of Leibniz.¹⁹ It is no wonder, then, that some of the most interesting and sophisticated recent interpretations of Leibniz emphasize the continuities between the two thinkers and argue, in particular, for deep continuities between Leibniz’s “phenomenalism” and Kant’s.²⁰

Nevertheless, Kant is very clear in other texts—especially in the Amphiboly of the Concepts of Reflection in the first *Critique*—that the properly Leibnizean conception of space differs quite fundamentally from his own. The most important difference comes under the heading of *matter* and *form*:

[I]n the concept of the pure understanding matter precedes form, and *Leibniz* consequently first assumed things (monads), together with an inner power of representation, in order afterwards to ground their external relations and the community of their states (namely, their

¹⁸ Robert DiSalle has suggested that Kant may here be describing his own earlier position in the *Inaugural Dissertation* (“On the Form and Principles of the Sensible and Intelligible [*intelligibilis*] Worlds”) of 1770. This makes sense, because Kant both characterizes the realm of simple beings as a “merely intelligible world [*bloß intelligibeln Welt*]” (4, 508) and describes “Leibniz’s idea” in terms that he himself can “comprehend” (*ibid.*). Note, however, that the view of the *Inaugural Dissertation* is quite distinct from Kant’s mature or critical transcendental idealism, in so far as Kant had not yet (in 1770) found a bridge between pure intellectual concepts and our (spatio-temporal) sensibility: the so-called *schematism* of the pure concepts of the understanding. I shall return to this last point below.

¹⁹ Kant’s assimilation of Leibniz’s idealism underwent a long evolution, from the earliest works of his pre-critical period, such as the *New Exposition of the First Principles of Metaphysical Knowledge* (1755) and *Physical Monadology* (1756), through the *Inaugural Dissertation* (1770), to its culmination in the critical period in the *Critique of Pure Reason* (1781/1786). Fully understanding Kant’s relationship to Leibnizean doctrines therefore involves not only distinguishing Kant’s attitudes towards Leibniz and his Leibnizean-Wolffian followers, but also distinguishing the stages of Kant’s own assimilation of Leibniz at various points in his intellectual development.

²⁰ See especially Adams (1994) and De Risi (2007).

representations) on this. Therefore, space and time were [thereby] possible—the former only through the relation of the substances, the latter through the connection of their determinations among one another as ground and consequence. This in fact is how it would have to be if the pure understanding could be related immediately to objects, and if space and time were determinations of things in themselves. If, however, they are only sensible intuitions, in which we determine all objects simply as appearances, then the form of intuition (as a subjective constitution of sensibility) precedes all matter (the appearances), and therefore space and time precede all appearances and all data of experience, and rather make them possible in the first place. (A267/B323)

Kant is describing the properly Leibnizean view that space and time arise from the purely intellectual relations between and determinations of the mind-like simple substances that constitute ultimate reality: space in terms of relations of co-existence among such substances, time from causal connections between their (individual) determinations or (inner) states.²¹ Kant is contrasting this conception of the sense in which space and time are well-founded phenomena with his own conception of them as pure forms of sensible intuition within which alone any substantial real object can be cognized in the first place—as what Kant himself calls an *appearance* (phenomenon) or *object of experience*.

The crucial point, for Kant, is that we can have (theoretical) cognition only of such appearances or objects of experience; (theoretical) cognition of noumena or things in themselves is completely impossible. For, in the absence of an already given spatio-temporal intuition within which to order and thereby determine such objects, the pure understanding on its own is capable of no (theoretical) cognition at all. Whereas I can certainly think objects of the pure understanding—such as God and the soul, for example—independently of spatio-temporal intuition, no such (noumenal) object can be (theoretically) cognized.²² This is why, for the critical Kant, pure concepts of the

²¹ Again, this view should be sharply distinguished from the (Leibnizean-Wolffian) view that space is *composed* out of “physical points” (or physical monads) as its parts. De Risi (2007) is especially concerned to argue that Leibniz’s more sophisticated approach to the problem of the composition of the continuum involves moving away from the traditional model of part-whole composition and towards the modern conception of abstract relations between elements in what we now take to be set-theoretic structures.

²² See the important footnote to the (second edition) Preface (Bxxvi): “In order to *cognize* an object it is required that I can prove its possibility (whether in accordance with the testimony of experience from its actuality or a priori through reason). But I can *think* whatever I wish, as long as I do not contradict myself—i.e., if my concept is only a possible thought, even if I cannot guarantee whether or not an object corresponds to it in the sum total of all possibilities.” Kant indicates in the remainder of the note that one may be able to cognize such (supersensible) objects through reason from a practical as opposed to purely theoretical point of view—which is why I have inserted the qualifier “theoretical” in parenthesis. I shall return to Kant’s conception of practical cognition at the end of this essay.

understanding such as substance, causality, and community can play their proper role in (theoretical) cognition only if they are associated with what Kant calls spatio-temporal *schemata*: substance with the temporal relation of permanence, causality with the temporal relation of succession, community with the spatio-temporal relation of simultaneous (co-)existence.

In the case of the concept of substance, in fact, Kant eventually arrives at an even stronger result. Not only must (phenomenal) substance be temporally extended (as permanent), it must be spatially extended as well—and so, by the argument of the Second Antinomy, it can neither be simple nor consist of ultimately simple (substantial) parts. Kant suggests this conclusion a few pages earlier in the Amphiboly, where he contrasts his own conception of the constitution of matter with Leibniz’s monadic conception:

Only that is internal in an object of pure understanding which has no relation at all (with respect to its existence) to anything different from itself. By contrast, the internal determinations of a *substantia phaenomenon* in space are nothing but relations, and it itself is nothing but a totality of mere relations. We are only acquainted with substance in space through forces that are active in space, either driving others into [this space] (attraction) or stopping their penetration into it (repulsion and impenetrability). We are acquainted with no other properties constituting the concept of a substance which appears in space and which we call matter. As object of the pure understanding, on the other hand, every substance must have internal determinations and powers, which pertain to [its] internal reality. However, what can I entertain as internal accidents except those which my inner sense presents to me—namely, that which is either itself a *thought* or is analogous to it? Therefore, Leibniz, after he had taken away everything that may signify an external relation, and therefore also *composition*, made of all substances, because he represented them as noumena, even the constituents of matter, simple substances with powers of representation—in a word, **monads**. (A265-6/B321-2)

Kant is here alluding to his critical conception of matter (and material substance) as filling the space that it occupies by the interplay of attractive and repulsive forces exerted at every point of the space in question. And it is precisely this conception that underlies the demonstration of infinite divisibility in the Dynamics chapter of the *Metaphysical Foundations*—which is followed, as explained above, by a (second) remark rejecting the Leibnizean-Wolffian doctrine of physical monads.²³

²³ The first remark rejects Kant’s own earlier conception in the *Physical Monadology*, according to which matter consists of ultimately simple monads that fill the space they occupy by attractive and repulsive

This demonstration of infinite divisibility, moreover, plays an essential role in Kant's demonstration of the permanence of material substance in the second proposition of the following Mechanics chapter—the proposition that the total quantity of matter in the universe is necessarily conserved in all interactions of matter. And the latter proposition, in turn, plays an essential role in Kant's conception of how momentum or what he calls “mechanical moving force” is conserved in all interactions as well. The schematized category of substance is thereby connected to the schematized category of community or interaction, with the result that it is a sufficient condition for the existence of a causal interaction between two material substances that momentum (the product of quantity of matter and velocity) be conserved in the process of action and reaction.²⁴ Finally, since momentum between two gravitationally interacting bodies is necessarily so conserved, it becomes crystal clear, at this point, that the physics for which Kant's theory of experience is providing a metaphysical foundation is Newtonian physics—and, indeed, a foundations for this physics in which gravitational attraction at a distance (and thus causal action at a distance) is enthusiastically embraced.²⁵

We have now reached the heart of the matter. In his life-long attempt to find a middle ground between the Leibnizean and Newtonian positions—between the “metaphysical” and “mathematical” approaches to nature—Kant always embraced Newtonian rather than Leibnizean physics. And he gradually came to see, in the critical period, that only *transcendental* idealism, in which “the form of intuition (as a subjective constitution of sensibility) precedes all matter” (A267/B323), can possibly do justice to the scientific cognition of the natural world that Newton had in fact achieved. For Newton begins his argument in the *Principia* by presupposing that (Euclidean) geometry is true of real (physical) space—at least throughout the Solar System. On the basis of this

forces exerted at only the central point of the space in question. Kant thereby arrived at a point-center atomism similar to that developed around the same time in Boscovich (1758). Kant's critical conception of matter, by contrast, is incompatible with the physical monadologies developed by both the Leibnizean-Wolffians and his own earlier self—and, most importantly in the present connection, with the properly Leibnizean conception of substance as well. For detailed discussion of Kant's earlier physical monadology, in relation to both his critical conception and his evolving divergence from Leibniz, see Friedman (2013).

²⁴ For further discussion of the interconnections among quantity of matter, mechanical moving force, and momentum in the *Metaphysical Foundations* see Friedman (2013, chapter three). Kant reformulates the principle of the permanence of substance in the second edition of the *Critique* as a quantitative conservation law (B224): “In all change of the appearances substance is permanent, and its quantum in nature is neither increased nor diminished.” This echoes the corresponding proposition in the *Metaphysical Foundations* (4, 541): “In all changes of corporeal nature the total quantity of matter remains the same, neither increased nor diminished.”

²⁵ In sharp contrast to Newton's much more cautious attitude, Kant's understanding of Newtonian physics involved an enthusiastic embrace of action at a distance throughout his career: see the Introduction to Friedman (2013) and compare Friedman (2009).

presupposition and his Axioms or Laws of Motion, which govern the (physical) concepts of mass, force, and (true or absolute) motion, Newton is then able to derive the law of universal gravitation from the initial “Phenomena” described by Kepler’s laws of planetary motion and, at the same time, to establish the center of mass of the Solar System as the privileged state of rest relative to which all true motions therein are to be defined. Newton’s achievement, for Kant, is paradigmatic of scientific cognition of nature, and Kant aims, in the *Metaphysical Foundations*, to give it a metaphysical foundation—that is, to explain, on the basis of the categories or pure concepts of the understanding, how this kind of knowledge is possible.²⁶

Kant’s explanation substitutes his own three Laws of Mechanics—the conservation of the total quantity of matter, inertia, and the equality of action and reaction—for Newton’s Laws of Motion, and Kant takes these laws to realize or instantiate the three Analogies of Experience established in the first *Critique*: the principles governing the categories of substance, causality, and interaction or community. And what is most important, as I have emphasized, is that the pure concepts in question are spatio-temporally schematized here: the quantity of substance is given by the aggregate of movable matter continuously filling a given space, causality pertains to changes in the quantity of motion (momentum) in a body effected by a second body spatially external to the first, interaction or community pertains to the relations of co-existence or simultaneity between spatially distant bodies throughout the whole of (physical) space. So universal gravitation, as a genuine action at a distance throughout this space, is a paradigmatic realization of the category of community.²⁷ Similarly, as I have also emphasized, the

²⁶ I discuss Kant’s “metaphysical” reinterpretation of Newton’s argument for universal gravitation in great detail in Friedman (2013); see the Introduction to Friedman, ed. (2004) for a shorter and more accessible account. Kant reinterprets what he calls “absolute space,” in particular, as a limiting idea of reason—as the never to be arrived at ideal endpoint of a procedure for moving (in accordance with Newton’s argument) from our parochial perspective here on the surface of the earth to the center of mass of the Solar System, and from there (in accordance with Kant’s own speculative extrapolation) to the center of mass of the Milky Way galaxy, the center of mass of a rotating system of such galaxies, and so on *ad infinitum*. This reinterpretation of absolute space is reflected in an important footnote (A429/457) to the antithesis of the First Antinomy in the *Critique*, which concerns the extent of the phenomenal world in space and time. I discuss this footnote, in relation to absolute space in the *Metaphysical Foundations*, in Friedman (2013, pp. 156-9).

²⁷ This is important, not only because Leibnizean physics explicitly rejects such action at a distance and restricts all physical interaction to impact, but also because of the way in which Leibniz’s own metaphysical foundation for this physics builds an analogous restriction into the more fundamental monadic level. For example, in “Specimen Dynamicum” (1695) Leibniz grounds the phenomenal forces of inertia, *vis motrix* (momentum), and *vis viva* (kinetic energy)—which together explain interaction by (perfectly elastic) impact—in more fundamental (passive and active) powers exercised in the realm of non-spatio-temporal noumenal substances of which the spatio-temporal realm of matter and motion is a well-founded phenomenon. And at the noumenal or monadic level, more generally, there are no causal interactions among substances at all, but only a pre-established harmony that coordinates their causally

category of substance, which is the most fundamental purely intellectual concept for Leibniz, can find nothing at all ultimately simple and self-subsistent in its application to natural phenomena.²⁸ As Kant puts it in his Solution of the Second Antinomy, *phenomenal* substance—the only kind of substance that can be an object of (theoretical) cognition for us—is merely “a permanent image of sensibility, and it is nothing but an intuition, in which there is nowhere anything unconditioned to be found” (A525-6/B553-4).

In sum, Kant’s critical conception of transcendental idealism is based on two fundamental ideas, both of which made perfectly good sense in his eighteenth-century intellectual context. The first, the argument from geometry, depends on Kant’s conviction that geometry is a synthetic rather than analytic a priori science. Although Leibniz, for one, did not share this conviction, I believe that Kant’s view, all things considered, was perhaps more reasonable at the time—given the essentially constructive proof-procedure of Euclid’s *Elements* together with the very limited state of eighteenth-century logical theory.²⁹ And from Kant’s view it does follow, in accordance with the Transcendental Exposition added to the second edition of the *Critique*, that our representation of space is an (a priori) intuition rather than a concept. Moreover, given the extant Newtonian and Leibnizean conceptions of the nature of space and time themselves, it is similarly reasonable for Kant to conclude that they just are the corresponding intuitive representations—so that intellectually conceived things in themselves (if there are such) are not spatio-temporal at all.

Yet this conclusion by no means amounts to the critical doctrine of transcendental idealism. It was already fully present in the pre-critical *Inaugural Dissertation* (1770), and it is very close, in any case, to Leibniz’s own doctrine of phenomena and noumena, of the sensible and intelligible worlds. In the *Inaugural Dissertation*, however, there was as yet no clear connection between our sensible and intellectual knowledge. There was no basis for concluding that knowledge of purely intellectual noumena is impossible, and, more generally, there was no conception of the necessary schematism of the pure

independent unfolding. Kant discusses the doctrine of pre-established harmony briefly in the Amphiboly, sandwiched between discussions of substance and space and time, under the rubric of the *community of substances* (A330-1/B274-5).

²⁸ The concept of substance, for the critical Kant, corresponds to nothing truly substantial in inner sense either, that is, in our self-conscious experience of our own inner states. Here Kant diverges fundamentally from Leibniz (and Descartes) by arguing that our pure self-consciousness or pure apperception reveals, by the argument of the Paralogisms of Pure Reason, no actual object that could be self-subsistent, substantial, or ultimately simple. And, by the argument of the Refutation of Idealism, all substance whatsoever must be realized in space. I discuss these points, in relation to both the *Metaphysical Foundations* and the *Critique*, in the Conclusion of Friedman (2013).

²⁹ For my most recent discussion of this issue see Friedman (2010, pp. 585-99).

concepts of the understanding in terms of our spatio-temporal intuition—the only kind of intuition of which we human beings are capable. It was only in the *Critique of Pure Reason* (1781/1787) that Kant was able to demonstrate (at least to his own satisfaction) that and how the purely intellectual concepts of substance, causality, community, and so on function as a priori conditions underlying the possibility of all human experience of the sensible world.³⁰ And an equally important negative conclusion then followed. Such purely intellectual concepts or categories only have objective (theoretical) meaning and significance when applied to objects of our experience in the sensible world; they do not have such meaning and significance when one attempts also to apply them to (putative) supersensible objects such as God and the soul.³¹

Nevertheless, it is equally important to Kant that pure intellectual concepts can have objective meaning and reality from a purely practical point of view. According to the *Critique of Practical Reason* (1788), in particular, the three principal ideas of pure practical reason—God, Freedom, and Immortality—all acquire such meaning and reality in relation to our own immediate experience of the moral law as authoritatively binding on our will. The idea of Freedom acquires it directly from the immediate experience in question. The other two ideas, God and Immortality, then acquire it indirectly, as necessary presuppositions or postulates for the possibility of our achieving (or at least continuously approximating) the highest end of morality: the realization of an ideal moral community of all human beings (a Kingdom of Ends) here on the surface of the earth. In the case of these ideas, therefore, although they forever elude our theoretical cognition, we do have a well-grounded rational faith or belief in their objective reality—although, once again, only from a purely practical point of view. It is precisely this that Kant has in mind in the Preface to the second edition of the *Critique* when he famously

³⁰ Thus the Transcendental Deduction of the Categories—which was completely rewritten in the second edition—is an essential part of the critical doctrine of transcendental idealism. I discuss aspects of the second edition version, in relation to Kant's conception of space and geometry, in Friedman (forthcoming).

³¹ Langton (1998) interprets Kant's doctrine of "our ignorance of things in themselves" as deriving from a fundamentally Leibnizean conception of substance involving only the *intrinsic* properties of a thing—properties holding independently of a thing's relations to others. She bases this interpretation on a clear and illuminating discussion of Kant's pre-critical writings, which she then extrapolates into the critical period. For Langton, then, the ignorance in question does not depend on any special features of space and time, but only on the fact that sensibility, for Kant, is receptive—so that it therefore essentially involves an *extrinsic* relation of a thing to us. On the present interpretation, by contrast, Kant's transcendental idealism is not only based on the radically new conception of space and time as pure forms of sensible intuition that first emerges in 1770, but also (and most importantly) on the distinctively critical doctrine of the schematism of the pure concepts of the understanding that only emerges in 1781.

asserts that he had to “deny *knowledge* [*Wissen*] in order to make room for *faith* [*Glauben*]” (Bxxx).³²

So it is especially striking, finally, that Kant also finds a purely practical reinterpretation of the Newtonian doctrine of divine omnipresence throughout all of infinite space. I explained at the beginning of this essay how Kant, in the Aesthetic, rejects the alternative Newtonian conception of space largely because of its commitment to this doctrine. I also suggested (note 26 above) that Kant’s conception of the extent of the material universe in space in the First Antinomy is closely connected to his reinterpretation of the Newtonian conception of absolute space as a framework for determining true motions. In an important footnote appended to the General Remark to the Third Part of *Religion Within the Limits of Reason Alone* (1793) Kant then describes a “sublime analogy” between the (theoretical) community of all matter in space due to universal gravitation and the (purely practical) ideal moral community of all rational (human) beings on the surface of the earth:

When Newton represents [the universal gravitation of all matter in the world] as, so to speak, divine universal presence in the appearance (*omnipaesentia phenomenon*), this is not an attempt to explain it (for the existence of God in space contains a contradiction), but rather a sublime analogy, in which it is viewed merely as the unification of corporeal beings into a world-whole, in so far as we base this upon an incorporeal cause. The same would happen in the attempt to comprehend the self-sufficient principle of the unification of the rational beings in the world into an ethical state and to explain the latter from the former. We know only the duty that draws us towards this; the possibility of the intended effect, even when we obey this [duty], lies entirely beyond the limits of all our insight. (6, 138-9)

Thus here, once again, Kant’s complex and multi-layered conception of transcendental idealism has both a positive and negative aspect within the realm of theoretical cognition. His “metaphysical” explanation of the possibility of Newton’s paradigmatic theoretical achievement amounts, at the same time, to a rejection of the doctrine of divine omnipresence—which Kant takes to be Newton’s own attempt to achieve “extravagant insight” into the supersensible. Yet Kant also finds, from a purely practical point of

³² Thus Kant’s denial of the possibility of theoretical cognition of the supersensible is precisely what opens up the possibility for a distinctive kind of practical cognition (Bxxix-xxx): “I can thus not even *assume* [*annehmen*] *God, Freedom and Immortality* on behalf of the necessary practical use of my reason, if I do not, at the same time, *deprive* [*benehme*] speculative reason of its pretension to extravagant insights.”

view, a legitimate (analogical) use for this same Newtonian doctrine in effectively directing us towards the very highest ends of morality.

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