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The Antinomies and Kant's Conception of Nature

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by

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To my parents, Ruth and Amikam Shimoni

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Note on References and Abbreviations

References to the *Critique of Pure Reason* are to the pagination of the first (A) and second (B) editions. Other writings by Kant are cited by section number (if applicable) and volume and page number of *Kants Gesammelte Schriften* (edited by the German Academy of Sciences, Berlin: Walter de Gruyter, 1900–). Translations to English are for the most part from the Cambridge Edition of the Works of Immanuel Kant (edited by Paul Guyer and Allen Wood, Cambridge: Cambridge University Press, 1992–). Other translations used are indicated in the list below. References to translations which do not include the pagination of the Academy are both to the pagination of the Academy and to page number in the translation. Unless otherwise stated, all emphases (whether in italics or in boldfacing) are in the sources. The following abbreviations are used for works by Kant and other primary sources:

CJ: *Critique of the Power of Judgment* (1790).

DiS: *Concerning the Ultimate Foundation of the Distinction of Directions in Space* (1768).

Diss: *Concerning the Form and Principles of the Sensible and Intelligible World* (Inaugural Dissertation, 1770).

FI: *First Introduction to the Critique of the Power of Judgment.*

This is the first, longer version of the introduction to the *Critique of the Power of Judgment*. In Immanuel Kant, *Critique of the Power of Judgment*, translated by Paul Guyer and Eric Matthews, Cambridge: Cambridge University Press, 2000.

L: Leibniz, Gottfried Wilhelm. *Philosophical Papers and Letters*. 2nd edition. Edited by L. E. Loemker. Dordrecht: Reidel Publishing Company, 1969.

LF: *Thoughts on the True Estimation of Living Forces* (1747).

Partial translation in Immanuel Kant, *Kant's Inaugural Dissertation and Early Writings on Space*, translated by John Handyside and Norman Kemp Smith, Chicago: Open Court, 1929 (abbreviated "**HK**").

MF: *Metaphysical Foundations of Natural Science* (1786).

NE: *New Elucidation of the First Principles of Metaphysical Cognition* (1755).

OPA: *The Only Possible Argument in Support of a Demonstration of the Existence of God* (1763).

P: *Prolegomena to Any Future Metaphysics That Will Be Able to Come Forward as Science* (1783).

PM: *The Employment in Natural Philosophy of Metaphysics Combined with Geometry, of which Sample One Contains the Physical Monadology* (1756).

UNH: *Universal Natural History and Theory of the Heavens, or Essay on the Constitution and Mechanical Origin of the Entire Universe, Treated in accordance with Newtonian Principles* (1755).

In Immanuel Kant, *Kant's Cosmogony*, translated by William Hastie, Glasgow: James Maclehose and Sons, 1900 (abbreviated “**H**”); and in Immanuel Kant, *Universal Natural History and Theory of the Heavens*, translated by Stanley L. Jaki, Edinburgh: Scottish Academic Press, 1981 (abbreviated “**J**”).

Chapter 1: Introduction

In the *Prolegomena*, Kant claims that the antinomy is the “the strangest phenomenon” and the “most remarkable phenomenon” of human reason, and that “it works the most strongly of all to awaken philosophy from its dogmatic slumber, and to prompt it toward the difficult business of the critique of reason itself” (P §52a, 4:339; P §50, 4:338). In the *Critique of Pure Reason*, he similarly states that the antinomy “guards reason against the slumber of an imagined conviction” (A407/B434). Late in life, Kant wrote to a correspondent:

It was not the investigation of the existence of God, immortality, and so on, but rather the antinomy of pure reason... that... first aroused me from my dogmatic slumber and drove me to the critique of reason itself, in order to resolve the scandal of ostensible contradiction of reason with itself (letter to Christian Garve, October 1798, 12:257-58).

By Kant’s own admission, the antinomy was what first prompted him to engage in a critical examination of reason and metaphysics. It is also what keeps us on the proper path of critical thinking and prevents us from falling back into dogmatic, traditional doctrines. In this dissertation, I provide an account of the formation of Kant’s conception of nature in light of the development of his thought on the antinomy. I carry out this project by tracing the history of the antinomy from the early stages of the pre-critical period to the *Critique of Pure Reason* and the *Critique of the Power of Judgment*.

Recent literature emphasizes the search for the origins of the critical philosophy in the pre-critical texts,¹ but a systematic examination of the role of the antinomy in the critical turn is still lacking. Reflections on the historical roots of the antinomy focus mainly on discussions of the relevant conflicts presented by philosophers prior to Kant, and less on Kant's own considerations of the conflict in the pre-critical texts.² Studies that do search for the roots of the antinomy in Kantian texts usually set out from the 1770 Inaugural Dissertation and leave behind pertinent discussions in earlier texts, presumably partly due to the tendency to focus on the first antinomy.³

A systematic examination of the development of Kant's thinking on the antinomial conflicts from the pre-critical texts to the critical period has significant merits. First, in providing such an examination, I elucidate the history of Kant's thinking on nature from the perspective of an essential feature of his critical philosophy, namely, the antinomy. Furthermore, I clarify the role of the Dissertation as a milestone in the critical turn, which leads to a proper understanding of this writing. Through this project, I also shed light on Kant's arguments in the Antinomy chapter in the *Critique* and help one see that, not only are they not inconsistent with current metaphysics and philosophy of science, they are in fact more relevant to current work in these fields than commentators usually suppose.⁴ Kant does not specify the reasons that led him to move from one stage of his development to the next. It is up to the reader to identify the stages and to reconstruct the course of the development of his thought. My aim is not merely to describe the different stages, but

¹ See Buroker, 1981; Laywine, 1993; Langton, 1998; Grier, 2001; Watkins, 2005.

² See for example Al-Azm, 1972; Wood, 2010.

³ See Kemp Smith, 1923, pp. 431-40; Guyer, 1987, pp. 385-404; Guyer and Wood, 1998, pp. 36-38, 44-45, 56-60, 63-65; Grier, 2001, pp. 191-94. Henry Allison notes that he prefers to focus on the first antinomy "because it is the most widely discussed and most clearly fits the antinomial picture" (Allison, 2004, p. 364).

⁴ In what follows, I designate chapters and sections in Kant's texts in uppercase, and arguments in lowercase. Thus, "Antinomy" refers to the relevant chapter in the *Critique*, and "antinomy" to the conflict or argument presented in that chapter.

to provide a defensible reconstruction of the evolution of Kant's thinking on the antinomial conflicts. In this reconstruction, I assume the "two perspective" reading of transcendental idealism. Thus, to the extent that my account is cogent, a further result of my study is that it lends additional support to the two perspective interpretation.⁵

That the antinomy is the "most remarkable phenomenon" of reason and that its function is to alert reason of its dogmatic convictions, is expressed in the fact that the antinomy consists in a "two-sided" illusion. That is to say, it is a type of illusion in

⁵ Transcendental idealism and its distinction between appearances and things in themselves have generated considerable controversy in the literature on Kant. My aim here is not to attempt to resolve this dispute. According to what is sometimes called the "standard view" of transcendental idealism, the distinction between appearances and things in themselves is an ontological distinction between two types of objects. Things in themselves are independent entities, while appearances are ideas caused by the affection of these independent things on the mind. On this reading, the ideality of the phenomenal world in Kant's theory amounts to some more sophisticated form of traditional phenomenalism or idealism of the Berkeleyan style. Its sophistication is expressed in the emphasis on the *a priori* aspects of the ideas caused in the mind. In contrast to traditional idealism, however, realism in Kant's theory is secured by the supersensible world of things in themselves. Interpretations along this line have been suggested ever since the publication of the *Critique*. Kemp Smith, 1923 and Strawson, 1966 constitute two influential, 20th century commentaries of this sort. An alternative approach, known as the "two aspect," "two conception," or "two perspective" view, construes the distinction between appearances and things in themselves as a distinction between two philosophical points of view with respect to which objects are considered, namely, in relation to the conditions of human sensibility or independently of this relation. This approach emphasizes the complex distinction between transcendental and empirical idealism and realism, and stresses both the *transcendental* character of Kant's idealism and his commitment to *empirical* realism. On this reading, Kant's idealism is radically different from traditional, ontological forms of idealism, since it does not "concern the existence of things... but only the sensory representation of things" (P 4:293). Furthermore, this approach avoids the absurdities implied in the affection of transcendent objects on the mind. Versions of this account are found in Paton, 1936; Bird, 1962 and 2006; Allison, 1983 and 2004; and Grier, 2001. Commentators have objected that such an epistemological reading lacks the important metaphysical thrust of Kant's doctrine and have further construed transcendental idealism along the traditional, ontological lines: Paul Guyer argues that "Kant does not confine himself to this anodyne interpretation" (1987, p. 4); Karl Ameriks maintains that "Kant's idealism transcends the merely 'epistemic' reading which Allison and those of his ilk propose" (1992, p. 341, note 5); and James Van Cleve insists that Kant "is an honest-to-goodness idealist regarding the entire world in space and time" (1999, p. 4). Other accounts of Kant's distinction do not strictly qualify as either of these two interpretive lines. Sebastian Gardner argues, for example, that certain statements in the *Critique* challenge the assumption that there is a uniform conceptualization of the distinction. This suggests a "disjunctive view," according to which Kant's distinction is to be taken in two object or two aspect terms according to the context (1999, pp. 294-98). Rae Langton (1998) contends that Allison's reading, which she summarizes as the thesis that we can have no knowledge of things in abstraction from the conditions of knowledge, is a trivialization of Kant's doctrine. In its place, she suggests construing the distinction between appearances and things in themselves as an ontological distinction between two types of properties, namely, relational and intrinsic properties respectively, of one and the same set of objects. Supporters of the two perspective view reply to these objections and further elaborate their position (see Allison 2004, 2006, and 2008), but the debate remains undecided (see Wood, Guyer, and Allison, 2007). As Bird claims, "the disagreements between traditionalist and revolutionary commentators remain unresolved" (Bird, 2006, p. 12. For a fuller mapping of the debate, see pp. 1-18).

which we are naturally and unavoidably led to form conflicting answers to a series of questions concerning certain aspects of the world. Such unavoidable conflicts may lead us to succumb to skepticism out of desperation or to dogmatically adopt answers without proper considerations, and in this way they may result in the “death of a healthy philosophy” (A407/B434). Consequently, the need for a critical inquiry into reason becomes evident. The series of questions and their conflicting answers presented in the Antinomy reflect an opposition between two fundamental approaches to understanding nature, namely, the “mathematical” approach and the “metaphysical” approach. The conflict between the two opposing approaches is found in Kant’s texts from the beginning of his intellectual career, and the development of Kant’s thinking on the opposition between these two approaches from these earlier stages of his career becomes more visible if one focuses on the second antinomy. In the remainder of the introduction, I would like to explain the opposition between the mathematical and the metaphysical approaches to understanding nature and to provide an overview of the present work.

1.1 Two Approaches to Understanding Nature

The Antinomy chapter presents a conflict between two parties. The first advances the theses that the world is bounded in time and space, that it consists of simple parts, that there are free actions in the world, and that a necessary being exists. The other advances the antitheses that the world is infinite, that there are no simple entities in the world, that everything happens necessarily and in accordance with the laws of nature, and that there is no necessary being. In section 3 of the Antinomy, Kant presents the conflict between the two parties as “the opposition of **Epicureanism** and **Platonism**” (A471/B499). He compares “the principles from which the two parties

proceed” and labels them the “principle of pure **empiricism**” and the “**dogmatism** of pure reason” (A465-66/B493-94). In the concluding chapter of the *Critique* (entitled “The History of Pure Reason”), Kant systematically distinguishes three aspects of the conflict, the first two of which are particularly relevant to the opposition under discussion here.

The first aspect pertains to the object of cognition. In this respect, the opposition is between “sensual philosophers” such as Epicurus and “intellectual philosophers” such as Plato (A853-54/B881-82). Sensual Epicureans conceive of reality as consisting of sensible objects alone. Intellectual Platonists, by contrast, apprehend it as constituted by intelligible entities.

The second aspect concerns the origin of cognition. According to the first party, cognition is derived from experience, while according to the other, cognition is independent of experience and its origin lies in reason. Adherents of the former position are called “empiricists,” while supporters of the latter view are called “noologists” (A854-55/B882-83).⁶ Kant mentions Plato and Leibniz as representatives of the first party, and he names Aristotle, Epicurus, and Locke as supporters of the latter.

Adherents of the metaphysical approach study nature *a priori* by means of conceptual considerations. They reflect on the world from the perspective of the logical relation between a whole and its parts. They regard the world as a systematic whole and analyze the character of its parts and the nature of the relations between them. Proponents of the mathematical approach study nature empirically. They focus on investigating sensible objects present in space and time. The relation between

⁶ Noologists (*Noologisten*, from *nous*) are rationalist philosophers. See the entry “Noologisten” in Rudolf Eisler’s *Wörterbuch der philosophischen Begriffe*: “Noologisten nennt Kant die rationalistischen Metaphysiker, insofern diese aus bloßen Begriffen, durch reines Denken die Wirklichkeit erkennen wollen.”

space (and time) on the one hand, and objects on the other, is an essential feature of their worldview.

I maintain that the opposition between these conflicting systems of thought is present in Kant's texts from the very beginning, albeit in cruder forms and under different titles. I further argue that in a series of attempts to reconcile them, Kant gradually refined these cruder forms until he came to the conclusion that reconciliation was hopeless, since the fundamental opposition between the two systems generates antinomies. Instead of simply accommodating them in a theory of nature, Kant came to hold in the *Critique* that one has to conceive of nature in a radically different way.

The clearest articulation of the opposition in the pre-critical texts is found in the 1756 *Physical Monadology*. Kant introduces the doctrine of physical monadology as an example of the "employment in natural philosophy of metaphysics combined with geometry." That is to say, this doctrine is introduced as an attempt to combine the metaphysical and the mathematical approaches (designated here as "metaphysics" and "geometry" respectively) in a unified theory of nature. The essay opens with the following remark concerning the "law" of investigating nature by means of experience and geometry alone.

... there have been some who have observed this law to such a degree that, in searching out the truth, they have not ventured to commit themselves to the deep sea but have considered it better to hug the coast, only admitting what is immediately revealed by the testimony of the senses. And, certainly, if we follow this sound path, we can exhibit the laws of nature though not the origin and causes of these laws. For those who only hunt out the phenomena of nature are always that far removed from the deeper understanding of the first causes. Nor will they ever attain knowledge of the nature itself of bodies, any more than those who persuade themselves

that, by climbing higher and higher up the pinnacles of a mountain they will at last be able to reach out and touch the heavens with their hands.

Metaphysics, therefore, which many say may be properly absent from physics is, in fact, its only support; it alone provides illumination (PM 1:475).

Empirical investigation is boundless. Progressing through its various stages will not lead to ultimate grounds and principles. One has to look to metaphysics for its completion. Thus, combining the two approaches is necessary for a complete theory of nature. A clue as to what metaphysics and geometry mean in this context, and why combining them in a theory of nature should seem to be a complicated task, is found in the continuation of the passage.

But how, in this business, can metaphysics be married to geometry, when it seems easier to mate griffins with horses than to unite transcendental philosophy with geometry? For the former peremptorily denies that space is infinitely divisible, while the latter, with its usual certainty, asserts that it is infinitely divisible. Geometry contends that empty space is necessary for free motion, while metaphysics hisses the idea off the stage. Geometry holds universal attraction or gravitation to be hardly explicable by mechanical causes but shows that it derives from the forces which are inherent in bodies at rest and which act at a distance, whereas metaphysics dismisses the notion as an empty delusion of the imagination (PM 1:475-76).

The passage lists three points of disagreement between metaphysics and geometry or physics: the divisibility of space, the emptiness of space, and action at a distance. Yet, metaphysics and geometry are not conceived here merely as different sets of conflicting propositions concerning certain aspects of the physical world. They rather reflect a clash between two general approaches to understanding nature. More specifically, they reflect the conflicting perspectives of Wolffian metaphysicians and Newtonian empiricists in the Berlin Academy in the 1740s and 1750s. The parties

differed over substantial ontological and epistemological issues. The metaphysicians presented *a priori* considerations regarding the fundamental elements of reality and the possibility of their interactions, while geometers were scientific-oriented thinkers who turned to experience and used mathematical expressions to formulate their empirical results. In the *Critique*, Kant similarly distinguishes between the “metaphysicians of nature” (*metaphysische Naturlehrer*) and the “mathematical investigators of nature” (*mathematische Naturforscher*) (A39-40/B56-57).

The opposition in the Antinomy chapter is an abstract opposition between two general intellectual approaches. Although it is illustrated in actual, historical clashes, the conflicting approaches should not simply be identified with concrete parties in these clashes. Nevertheless, it is useful to elucidate the abstract opposition by examining the ways in which it is exemplified in early modern philosophy and in the 18th century Berlin Academy.

Adherents of the mathematical approach in modern philosophy propounded a scientific-oriented attitude to the understanding of nature. This approach was inspired by modern mechanical philosophy. According to modern mechanical philosophy, everything in nature consists of material particles and is to be explained in terms of matter and motion. Changes in natural phenomena are nothing but different spatial organizations of material particles. Originally, such changes were thought to be possible only through action by contact, in line with Descartes’s strict mechanism. Later, this conception was modified so as to allow pulling and pushing at a distance by means of forces. Thus, the basic elements of reality according to the adherents of the mathematical approach are matter, space and time, and forces and the laws governing them (ultimately, Newton’s laws of motion). The methodology of the proponents of the mathematical approach combines experimentation and observation

with the mathematical formulation of their findings. For the supporters of this approach, Francis Bacon's inductivism and John Locke's empiricism were influential, while Isaac Newton's *Mathematical Principles of Natural Philosophy* set the example.

Proponents of the metaphysical approach in the 18th century Berlin Academy drew their main inspiration from Leibniz and Wolff. Their approach focuses on the world as a whole system and attempts to account for the nature of the parts that constitute the whole and the nature of the relations between them. According to this approach, simple substances are the fundamental entities comprising the world, while the world is a coordinated system of such entities. The coordination of the system is grounded either on a harmony between disconnected substances instituted by God or on actual interactions between substances. Space and time, whether real or ideal, are derived from relations among substances. From the methodological point of view, the supporters of the metaphysical approach advance conceptual considerations concerning the composition of the world and its basic constituents by means of certain rational principles. The most fundamental are the principles of contradiction and sufficient reason.

In what follows, I will use the terms "mathematical approach" and "metaphysical approach" to refer to these two conflicting intellectual approaches to understanding nature. However, it will be useful to bear in mind that Kant uses multiple labels to designate these two approaches. He refers to the first party and its adherents by the labels Epicureanism, empiricism, physics, science, geometry, and mathematical investigators of nature. He refers to the second party as dogmatism, Platonism,

intellectualism, and metaphysics.⁷ Again, it is important to note that the approaches are general attitudes to understanding nature and need not be identified with particular systems of actual thinkers. Leibniz, for example, is not always easily classified either as an adherent of the mathematical approach or as a proponent of the metaphysical approach.

1.2 Overview

In this dissertation, I focus on the development of Kant's conception of nature. Therefore, I discuss the mathematical antinomies, which deal with the size of the world in space and time and with its composition, and thus directly pertain to Kant's conception of nature. I leave the discussion of the dynamical antinomies for another occasion. The dynamical antinomies concern the problem of freedom and the existence of a necessary being, and thus have practical and theological implications. I also consider the antinomy of the teleological power of judgment of the *Critique of the Power of Judgment*, since it has direct relevance to Kant's understanding of nature.

In Chapters 2 and 3, I examine the conflict constituting the second antinomy, namely, the conflict concerning the composition and divisibility of the world. The question here is whether objects consist of simple parts or whether they are composed of parts within parts to infinity. I focus on and start with the examination of the second antinomy because it illustrates the development of Kant's thinking on the

⁷ Note that in the *Critique*, Kant deems both parties dogmatic, since both share "the same mistake of immodesty," namely, "each of the two says more than it knows" (A471-72/B499-500). See also the footnote in A521/B549, where Kant explicitly distinguishes his resolution of the first antinomy from the *dogmatic* proof of the antithesis of the same antinomy (the antitheses represent the view of the adherent of the mathematical approach).

fundamental opposition at the heart of the antinomy more clearly. First, Kant explicitly identified the divisibility problem as a recalcitrant issue on which the two approaches to nature differ as early as the mid 1750s. Furthermore, the divisibility problem involves two fundamental issues that separate the two approaches, namely, the relation between space and objects and the relation between wholes and their constituent parts. It is thus intimately connected with a further issue that plays an essential role in the critical turn, namely, the status of space and the nature of the relation between space and objects.

In Chapter 2, I analyze the pre-critical accounts of the problem of divisibility. Kant considers the divisibility problem for the first time in his 1756 *Physical Monadology*. In this work, he recognizes the problem as one of the central conflicts between the two approaches and attempts to reconcile and combine them in a unified theory of nature by resolving this problem. He sets out from the conception of bodies as composite objects and thus concentrates on examining the relation between wholes and their constituent parts. Kant suggests a dynamical model of matter, which involves a relational view of space. This enables him to resolve the divisibility problem by claiming that bodies are both composed of simple parts and that the space they fill is infinitely divisible. The problem recurred later, when in the 1768 *Directions in Space* Kant changed his view regarding the relation between space and objects. In line with the mathematical approach, in this text he argues for a Newtonian conception of space. On this conception, space is a condition of the possibility of matter and its structure. This, in turn, implies that matter is infinitely divisible and, therefore, conflicts with Kant's physical monadology.

Kant resolves this conflict in the 1770 Inaugural Dissertation by separating the two approaches, instead of attempting to combine them as he did in the *Physical*

Monadology. More generally, the central doctrine of the Dissertation, namely the separation of the sensible and intelligible worlds, is motivated by the recognition that the notion of the world implies conflicting claims concerning the size and division of the world. That is to say, in the Dissertation, the same problems that constitute the subject of the mathematical antinomies in the *Critique* led Kant to distinguish two realms of being (sensible and intelligible) and correspondingly two cognitive faculties (sensibility and understanding). In this sense, the Dissertation is an important milestone on the way to the *Critique*. Furthermore, Kant's elaboration of the separation doctrine in the Dissertation makes it clear that the sensible world is not completely divorced from intellectual principles. This eventually led Kant to recognize that he was still committed to conflicting claims concerning the size and composition of the world. I suggest that Kant was referring to this when he claimed that the antinomy first aroused him from his dogmatic slumber and drove him to the critique of reason itself "in order to resolve the scandal of ostensible contradiction of reason with itself" (letter to Garve, 1798, 12:257-58).

In Chapter 3, I discuss Kant's reconsideration of the divisibility problem in the second antinomy in the *Critique*. In the *Critique*, Kant realized that a resolution of the conflict between the metaphysical and the mathematical approaches requires a radically new understanding of the empirical world. His critical examination resulted in a new distinction between two perspectives from which objects can be considered: one that takes the sensible conditions under which objects can be given to us into account (this is the new, critical meaning of "phenomena"), and one that considers objects in abstraction from these conditions and thus as objects of pure understanding

(i.e. “things considered in themselves”).⁸ This distinction enables Kant to resolve the conflicts concerning the size and composition of the world. The empirical world, properly taken as a phenomenon or as an appearance, cannot be said to have determinate size and composition, due to the nature of the spatial and temporal conditions under which objects are given to us. To assign determinate size and composition to the empirical world is to make a category mistake, since “having determinate size and composition” is a property which pertains to things considered in themselves, not to the world as an appearance. And because the world has no determinate size or composition, it cannot be said to be either finite or infinite, or to be either composed of simple parts or divisible to infinity. Thus, on Kant’s account, the debate about the size and composition of the world is misguided and presents merely a “dialectical opposition.”

Kant’s distinction between these two modes of considering objects is the essence of his transcendental idealism. His critical examination introduced a metaphysics of experience in which the basic principles of the rival approaches (i.e. the notion of bodies as composite objects and the relation between bodies and space) are

⁸ Kant maintains that to consider things as they are in themselves is to consider them “without paying attention to whether and how we might achieve acquaintance [*Kenntnis*] with them” (A498/B526-27). We achieve acquaintance with objects, or equivalently, objects are given to us, only through sensibility. The application of the understanding to what is given to us in this manner produces cognition (*Erkenntnis*). To consider things as they are in themselves is thus a claim to cognize things through understanding alone, independently of the spatiotemporal forms or conditions of the sensible intuition through which objects are given to us. This understanding of “things as they are considered in themselves,” namely as objects considered independently of our sensibility and as objects of pure understanding, recurs in central passages in the *Critique*. See, for example, the important passage from the Aesthetic, in which Kant asserts both the empirical reality and the transcendental ideality of space: “Our expositions accordingly teach the **reality** (i.e., objective validity) of space in regard to everything that can come before us externally as an object, but at the same time the **ideality** of space in regard to things *when they are considered in themselves through reason, i.e., without taking account of the constitution of our sensibility*. We therefore assert the **empirical reality** of space (with respect to all possible outer experience), though to be sure at the same time its **transcendental ideality**, i.e., that it is nothing as soon as we leave out the condition of the possibility of all experience, and take it as something that grounds the things in themselves” (A27-28/B44, italics added). Cf. the distinction in the Amphiboly chapter between “objects of a non-sensible intuition” (noumena in the negative sense) and “objects of pure understanding” (noumena in the positive sense) (A286-87/B342-43). See also B306 and A258/B313-14 in the Phenomena/Noumena chapter. Finally, see the crucial passages at A498/B526-27 and A500-01/B528-29 from the Antinomy chapter quoted below in section 3.2.1.

reinterpreted and, to paraphrase Graham Bird, placed in their proper locations in the map of human cognition and experience.⁹

In Chapters 4 and 5, I deal with the conflict involved in the first antinomy, that is, the conflict regarding the size of the world, or its extent in space and time. In what follows, I will focus on the temporal portion of the problem, namely, the question of whether the world has a beginning in time or whether it exists eternally. In Chapter 4, I consider Kant's pre-critical treatment of this question. Unlike the problem of divisibility, the question of the size of the world did not initially occur to Kant as one that presents a fundamental problem dividing the metaphysical and the mathematical approaches. He only first recognized the question as problematic in the Dissertation. Up to the Dissertation, Kant held that the cosmological question concerning the size of the world could be sufficiently addressed by metaphysical considerations or by mechanical accounts. He provides different accounts of the world in *New Elucidation* (1755), the *Universal Natural History* (1755), and the *Only Possible Argument* (1763). In *New Elucidation*, Kant considers the world from the point of view of the metaphysical approach, while in the *Universal Natural History*, he considers the world from the perspective of the mathematical approach. In the *Only Possible Argument*, he attempts to reconcile and combine the two accounts. Despite the fact that each account implies a different answer to the question of the temporal size of the world, Kant endorsed the position of the metaphysical approach and asserted that the world has a beginning in time. He ignored the position of the mathematical approach, according to which the world exists eternally and has no beginning in time, despite the fact that his theory of the world in the *Universal Natural History* implies that this is the case.

⁹ See Bird, 2006, p. 10.

In the Dissertation Kant reveals for the first time that the question of the size of the world posits a difficulty. He examines the notion of a “world” in general and maintains that it includes a requirement for a totality of parts. A world, on this conception, is a totally comprehensive system of things, one which cannot be a part of a more comprehensive system. This requirement makes the notion of the world problematic, since it can be interpreted in conflicting ways in accordance with intellectual or sensible principles. On the one hand, reason demands that one think of the world-whole as finite, while on the other hand, the conditions of sensible cognition require one to represent the world as a whole that expands infinitely in time and space. To repeat, the separation doctrine was supposed to provide a solution to the problem, and its failure made Kant recognize that an entirely different way of understanding the world was required. According to the solution suggested by the separation doctrine, the claim advanced by supporters of the metaphysical approach concerning the finitude of the world pertains to the intellectual world, while the claim advanced by supporters of the mathematical approach concerning the infinitude of the world is supposed to apply to the sensible world. And again, the fact that the sensible world cannot be entirely divorced from intellectual principles led Kant to recognize that he was still committed to conflicting claims concerning the size of the world.

In Chapter 5, I consider the first antinomy. Kant resolves this antinomy in a manner parallel to that in which he resolves the second antinomy. One can resolve the conflict concerning the size of the world if one takes the world to be an appearance. As an appearance, the world cannot be said to have determinate size, and therefore it need not be either finite or infinite. This resolution has important consequences that are relevant to modern cosmology as well. Kant concludes that the notion of the world is an idea of reason rather than an empirical concept. The empirical world is not an

object for us and, therefore, it is not given to us either as a finite or as an infinite object. Consequently, any attempt to determine the absolute origin and size of the empirical world as a whole is misguided. On Kant's account, it is perfectly legitimate to postulate an initial condition from which a theory of the world's history begins. On the other hand, it is illicit to attempt to determine the absolute status of this initial condition and to draw conclusions from it concerning the size of the world as a whole. We should note that Kant does not claim that the question concerning the absolute beginning of the world is an empirical question that cannot be scientifically examined. Instead, he contends that the question regarding whether the world is temporally finite or infinite is a transcendental question requiring a critical solution, rather than an empirical question to be subjected to scientific inquiry.

In Chapter 6, I deal with the antinomy of the teleological power of judgment presented in the *Critique of the Power of Judgment*. The problem of teleology consists of two related questions, namely, (1) whether nature evolves in a purely mechanical manner or whether there is also final causality in nature, and (2) whether it is in principle possible to explain all natural phenomena by mechanical principles or whether one must also employ teleological principles in the explanation of certain phenomena. The problem of teleology constitutes a further issue on which proponents of the metaphysical and the mathematical approaches differ. Proponents of the mathematical approach advance a thorough mechanistic view of nature, while proponents of the metaphysical approach in this context also emphasize the place of purposiveness in nature. The problem arises most clearly in the case of organisms or living phenomena.

In the pre-critical period, Kant presents conflicting answers to the question of teleology. In the *Universal Natural History*, Kant assumes the point of view of the

mathematical approach. Thus, this text implies that organisms, like everything else in the world, evolve mechanically, and that one should explicate the form and behavior of organisms by means of naturalistic explanations in terms of mechanical principles. By contrast, the *Only Possible Argument* adopts the metaphysical approach in this context and asserts that organisms cannot evolve by mechanical causality alone. Rather, certain features of living phenomena are intentionally instituted by God. One therefore cannot expect to provide complete mechanical explanations of living phenomena. Thus, the pre-critical accounts imply that naturalness and purposiveness exclude one another. Adhering to a naturalistic view of organisms rules out the possibility of attributing purposive features to them, while acknowledging their purposive features entails a designer and, therefore, undermines their status as natural things.

In the *Critique of the Power of Judgment*, Kant argues that one has to address the problem of teleology in a critical manner. Traditional, dogmatic approaches to the problem, including Kant's pre-critical analyses of the problem, base their resolutions of the problem on attempts to determine whether organisms actually have purposive features. In the third *Critique*, Kant instead construes the problem as a conflict between two maxims essential to our explanation of natural objects. Understanding mechanism and teleology in this way broaches the possibility of a theory of living phenomena which fruitfully combines the natural character and the purposive features we ascribe to organisms. I will argue that this resolution of the antinomy indicates that Kant's view of life sciences is more intriguing and closer than may seem at first blush to modern views, which emphasize the autonomy of biology as a genuine scientific discipline.

The structure of the dissertation outlined above reflects my main thesis, namely, that the antinomy played a concrete and an essential role in the development of Kant's philosophy and, in particular, of his conception of nature. In what follows, I substantiate this thesis by elucidating the development of Kant's conception of nature in light of the evolution of his thought on the antinomy, from the early stages of the pre-critical period to the *Critique of Pure Reason* and the *Critique of the Power of Judgment*.

Chapter 2: The Pre-Critical Accounts of the Problem of Divisibility

In this chapter, I examine Kant's series of attempts to reconcile the opposing metaphysical and mathematical approaches to understanding nature with respect to the problem of the divisibility of objects. The problem concerns two basic questions. First, are the parts of objects always further divisible into subparts, or do objects ultimately consist of simple, indivisible parts? Second, if objects do consist of simple parts, are these simple parts extended or non-extended things? Kant presents this problem in the *Physical Monadology* as one of the crucial issues in natural philosophy in which metaphysics and geometry conflict.

The divisibility problem involves two fundamental issues which sometimes lead in opposite directions: the relation between bodies and space and the notion of bodies as composite objects. The mathematical approach employs an absolutist account of space, while the conception of bodies as objects composed of simple parts is a cornerstone of the metaphysical approach. Each stage in the development of Kant's consideration of the divisibility problem centers on his analysis of these two fundamental issues. There are four major moments in the development of Kant's approach to the divisibility problem, namely, his analyses of the problem in the *Physical Monadology*, *Directions in Space*, the Inaugural Dissertation, and the second antinomy. I deal with the first three in the present chapter. I examine the discussion of this problem in the Antinomy in the following chapter.

In the *Physical Monadology*, Kant attempts to reconcile metaphysics and geometry by means of a dynamical model of matter. He conceives of matter as being

constituted by simple substances understood as elements exerting physical forces on one another. The physical and spatial properties of material bodies are derived from the interplay of the essential forces of their simple elements. The model thus involves a relational view of space, which enables Kant to claim that bodies are finitely actually divisible (i.e. composed of a definite number of simple substances) while infinitely ideally divisible (i.e. the space they fill is indefinitely divisible).¹⁰

In his 1768 *Directions in Space*, Kant's considerations of the spatial phenomenon of chirality or incongruent counterparts lead him to a Newtonian conception of space as absolute and objectively real. Space is taken to be an ontological condition of matter and its structure. This implies the infinite actual divisibility of matter and thus conflicts with the dynamical model of matter of the *Physical Monadology*.

In the Inaugural Dissertation of 1770, Kant resolves this conflict by separating the two approaches, instead of attempting to combine them as he did in the *Physical Monadology*. The Dissertation opens with an analysis of the notion of a world. Kant's analysis reveals that one can form conflicting propositions concerning the size and division of the world (i.e. the problems discussed in the mathematical antinomies). Kant resolves this difficulty by distinguishing two realms of being (sensible and intelligible) and correspondingly two cognitive faculties (sensibility and understanding). The Dissertation's doctrine of separation provides the basis for an alternative solution to the divisibility problem. According to this doctrine, conceptual considerations allow us to establish that intelligible things consist of simple parts on the one hand, while on the other hand we can claim that the division in sensitive intuition of empirical objects given in space proceeds indefinitely.

¹⁰ No satisfactory account of the problem can be given without clarifying in advance the different meanings of divisibility. The first section of the chapter succinctly establishes the technical terminology in use here by following Thomas Holden's distinctions in his *The Architecture of Matter*.

A close examination of the Dissertation reveals that the separation doctrine involves serious internal tensions and that it is violated in several places in the text. Such an examination makes it clear that the sensible world is not completely divorced from intellectual principles. As a result, in the Dissertation Kant is still committed to conflicting claims concerning the composition (and size) of the world. I maintain that Kant referred to his recognition of this problem when he claimed that the antinomy of pure reason had aroused him from his dogmatic slumber and driven him to the critique of reason.

The chapter is organized as follows. In the first section, I clarify the terminology of the discussion and the two fundamental issues involved (i.e. the relation between bodies and space and the notion of bodies as composite objects). I deal with Kant's envisaged unification of metaphysics and geometry in the *Physical Monadology* by means of the dynamical model of matter and its proposed solution to the divisibility dispute in the following section. In the third section, I discuss the conflict between Kant's early model of matter and his conception of space in *Directions in Space*. In the fourth section, I consider the analysis and solution presented in the Dissertation. In the fifth section, I examine the problems with the Dissertation's solution.

2.1 Divisibility, Space, Simples and Composites

Before getting into the details of the problem, it is necessary to be clear about just what "divisibility" means. Indeed, much unnecessary ado can be made about the question of divisibility if we do not first remove certain vague and ambiguous aspects

of this concept. To avoid falling prey to such obscurities, it may be helpful to use the distinctions introduced in Thomas Holden's *The Architecture of Matter*.¹¹

Holden distinguishes four forms of division and divisibility that an extended entity may possess. His first two forms of divisibility are types of *actual* divisibility. That is, they concern the possibility of separating and distancing the parts of the divided object from one another, and not merely the marking of borders between those parts. (1) *Physical* divisibility is the possibility of actually breaking apart an entity and distancing its parts by natural means and within the confines of laws of nature. By contrast, (2) *metaphysical* divisibility involves abstracting from the constraints of laws of nature. That an extended entity is metaphysically divisible means that there are no logical constraints which preclude the possibility of the separate existence of its spatially distinct parts.

A Newtonian atom is physically indivisible, since it is understood as a piece of matter which cannot be broken apart by any natural means. According to Newton, God created matter in primitive solid particles, and "no ordinary power [is] able to divide what God himself made one in the first creation."¹² Nevertheless, a Newtonian atom is metaphysically divisible. Its spatially distinct parts can be conceived as existing separately from one another, since there is no reason why God could not overcome its bonds and split it into parts. Newtonian space, by contrast, is both physically and metaphysically indivisible, since it is logically impossible to conceive of an actual distancing of adjacent regions of space. Put otherwise, such a division of space can be executed neither by natural means nor by God.

¹¹ Holden, 2004, pp. 9-16.

¹² Newton, *Opticks*, p. 400.

Holden's next two forms of divisibility are types of *ideal* divisibility. They have to do with the possibility of discerning parts within an object. (3) *Formal* divisibility turns on distinctness of spatial properties. An entity with parts that can be distinguished by their spatial properties is formally divisible, regardless of whether these parts can actually be distanced from one another. It is commonly accepted that extension implies formal divisibility. Thus, both Newtonian atoms and Newtonian space are formally divisible.¹³ (4) *Intellectual* divisibility is of less importance for our purposes. According to Holden, "An extended entity is *intellectually divisible* ... if and only if a mind could represent it in thought as containing diverse parts – regardless of whether those parts are separable in the thing itself (through either [physical] division or [metaphysical] division), and regardless of whether those parts are genuinely spatially distinct (i.e. [formally] divisible)."¹⁴

The problem of physical divisibility is primarily an empirical question concerning the strength and minuteness of particles of matter and the efficacy of the means of division. It is therefore less relevant to the question whether, in principle, objects consist of simple parts or are always further divisible.¹⁵ Accordingly, in what follows, I will focus on metaphysical and formal divisibility.¹⁶

¹³ In *Principia*, p. 796 Newton explains that mathematics shows us that we can distinguish "by our reason" smaller parts in the "undivided parts" of matter (i.e. we can formally divide atoms), although it is uncertain whether they "can actually be divided and separated from one another by the forces of nature" (i.e. be physically divided). If by "undivided parts of matter" Newton means primitive atoms, then, in contrast to his view in the *Opticks*, he seems to regard the claim that atoms are indivisible as dependent on our present state of knowledge.

¹⁴ Holden, 2004, p. 15.

¹⁵ Participants of the actual historical dispute over divisibility in modern philosophy make clear that it is metaphysical (and not physical) divisibility which is at stake. Descartes explains that when he claims that matter is indefinitely divisible, he means that it is always further (in Holden's terms) "metaphysically" divisible: "even if we imagine that God wished to create a particle of matter which was impossible to divide into smaller ones; that particle could not, even then, be properly called indivisible. For even supposing that He has made it such that *no created being could divide it*, He certainly cannot have deprived Himself of His ability to divide it; because, as we noticed earlier, it is absolutely impossible for Him to diminish His own power. Therefore, strictly speaking, this particle will remain divisible, since *it is so by virtue of its own nature*" (*Principles of Philosophy*, II, 20, italics added). Euler similarly stresses in his *Letters to a German Princess* that the divisibility question

With these clarifications in mind, we can now discuss the two central issues involved in the divisibility problem, namely, the relation between bodies and space and the notion of bodies as composite objects. Both issues, as we will see, play a crucial role in the second antinomy. On the former, Euler remarks in his *Letters to a German Princess*:

The controversy between modern philosophers and geometers... turns on the divisibility of body. This property is undoubtedly founded on extension, and it is only in so far as bodies are extended that they are divisible and capable of being reduced to parts.¹⁷

Space, as a continuous magnitude, is infinitely formally divisible. A spatial region, however small, can always be further divided; its division never ends in indivisible, simple parts of which it is composed. The question is whether this essential characteristic of spatial extension is somehow carried over to material bodies. If spatial extension is a primitive property of bodies, they can no more be composed of simple parts than space itself is.

There are different ways of conceiving of extension as an essential property of matter. Descartes's system presents one obvious example. Descartes identifies space with matter and maintains that the nature of body consists in extension: "the same

concerns not "what may be possible for us to execute" or "what we are in a position to perform," but rather "what is possible in itself" and what "the Divine Omnipotence is able to accomplish" (*Letters*, pp. 214, 216, 220).

¹⁶ When discussing the divisibility of space and matter in the *Metaphysical Foundations of Natural Science*, Kant distinguishes between "physical divisibility" (and division) and "mathematical divisibility" in a way that corresponds to Holden's physical and formal divisibility, respectively. Although he does not explicitly distinguish between metaphysical and physical divisibility, Kant is in fact interested in the contrast between metaphysical and physical divisibility (in Holden's sense) on the one hand, and mathematical (or Holden's formal) divisibility on the other.

¹⁷ Euler, *Letters*, p. 213.

extension which constitutes the nature of body also constitutes the nature of space.”¹⁸

Therefore, bodies, just like space, are not made up of indivisible, simple parts.

We also easily understand that it is not possible for any atoms, or parts of matter which are by their own nature indivisible, to exist. The reason is that if there were such things, they would necessarily have to be extended, no matter how tiny they are imagined to be. We can, therefore, still conceive of each of them being divided into two or more smaller ones, and thus we know that they are divisible. For it is impossible to [clearly and distinctly] conceive of dividing anything without knowing, from that very fact, that it is divisible.¹⁹

Locke and Newton argue that the property of filling space or solidity differentiates matter from space and thus reject Descartes’s identification of space and matter.²⁰

Nevertheless, on their conception extension is a “primary quality” of bodies. They adopt an absolutist view of space, namely, they conceive of space as a receptacle in which solid bodies extend and thus as a condition for the existence of bodies. Consequently, bodies are essentially extended entities.

The second central issue involved in the divisibility problem concerns the notion of bodies as composite objects which consist of simple parts. The requirement that bodies consist of simple parts stems from the nature of mechanical explanation and from general considerations concerning the relation between a whole and its parts. To explain a physical object mechanically is to derive its properties from the properties of its parts. The properties of the parts depend, in turn, on the properties of their parts, and so on. If this mode of explanation is to work, it seems that a certain ground floor of fundamental parts with primitive properties has to be postulated.

¹⁸ Descartes, *Principles of Philosophy*, II, 11.

¹⁹ Descartes, *Principles of Philosophy*, II, 20.

²⁰ On Locke’s and Newton’s rejection of the Cartesian identification of matter and space, see Shimony, 2011.

The relation between a whole and its parts is discussed in the Antinomy chapter in the *Critique*. There Kant distinguishes between a *compositum* (real composite) and a *totum* (whole or ideal composite). The parts of a *compositum* are logically prior to the composite object. A composite thing depends on its parts and their joining together, while the parts can be separated from one another and exist on their own. A *totum*, on the other hand, is logically prior to its parts. The parts are distinguished only in relation to other parts in the whole.²¹ Material bodies are real composites. They depend on their parts being joined together.²² If these parts are again composite, they depend on their parts, and so on. Now if the composite is to be possible, the regress cannot proceed to infinity but has to end with parts that are not composed of any further subparts, that is, indivisible, simple parts.

Leibniz's reasoning incorporates these two fundamental points. On the one hand, Leibniz agrees that a body, as an extended mass in space, is infinitely divisible and does not consist of indivisible material parts, since "*material atoms* are contrary to reason."²³ On the other hand, his claim that simple parts necessarily exist²⁴ poses a problem, since neither material parts nor mathematical points could count as simple

²¹ See A438-440/B466-468.

²² Space, by contrast, is a *totum*: the various spatial regions are distinguished with respect to the whole space.

²³ Leibniz, *New System* §11, L 456. See also §3, L 454.

²⁴ Leibniz opens his *Monadology* with a statement of this requirement: "The monad... is nothing but a simple substance which enters into compounds... There must be simple substances, since there are compounds, for the compounded is but a collection or an aggregate of simples... The monads are the true atoms of nature; in a word, they are elements of things. We need fear no dissolution in them, and there is no conceivable way in which a simple substance can be destroyed naturally" (§§1-4, L 643). And see also the references above to *New System* and *Principles of Nature and Grace* §1, L 636. Christian Wolff argues that simples are the ground of composites: "If there are composite things, there must also be simple beings. For if no simple beings were present, then all parts – they can be taken to be as small as you might ever like, even inconceivably small parts – would have to consist of other parts. But then, since one could provide no reason where the composite parts would ultimately come from, just as little as one could comprehend where a composite number would arise from if it contained no unities in itself, and yet nothing can be without a sufficient ground..., one must ultimately admit simple things from which the composites arise" (*Rational Thoughts* §76). Alexander Baumgarten also reasons that if there are composites, there must be simples: "A composite cannot exist, except as the determinations of others... Now, apart from composites, there are only simples... Therefore, if composites exist, monads exist" (*Metaphysics* §245).

parts. The former are themselves composites things, and the latter are limits and not parts of extended bodies. These “difficulties in the composition of a continuum,” Leibniz writes to a correspondent, “ought to warn us that we must think far differently of things.”²⁵ These considerations lead Leibniz to claim that bodies essentially consist in active “metaphysical points” or simple substances construed in a way analogous to spirits.²⁶

The nature of the relation between bodies and their ultimate parts in Leibniz’s philosophy remains obscure.²⁷ In certain places, bodies are said to be well-founded phenomena grounded in these simple substances, but in others they are supposed to be actual aggregates of substances. In either case, it is clear that corporeal things essentially consist in force and activity, not in spatial properties such as extension. Extension is not a primitive property of these substances. Rather, it is merely derivative of the inherent forces of substances. Space is likewise not a condition of their existence, but rather consists in the relations between them.²⁸ A relational account of space is thus intimately connected to the view that bodies consist in simple parts. Euler succinctly summarizes this line of thought as follows. Since it is “a

²⁵ Letter to Bartholomew des Bosses, June 16, 1712, L 604.

²⁶ See *New System* §3, L 454. For a recent analysis of Leibniz’s discussions of divisibility and simple parts of matter, see Hartz, 2007, chapters 2 and 3. Hartz shows that Leibniz is concerned with two aspects of division of matter. From one point of view, matter is regarded as infinitely *divisible* into ever smaller mass-parts. From another, matter is actually *divided* into simple substances. This distinction, Hartz suggests, enables Leibniz to finally find his way out of the “labyrinth of the continuum” (Hartz, 2007, p. 72).

²⁷ It is also not entirely clear whether Leibniz held to one coherent conception of the ultimate parts of bodies. At times he considers them simple, mental substances (e.g. in the *Monadology*), while at other times he seems to advance the claim that corporeal substances composed of matter and form are the fundamental building blocks of the physical world (especially in writings from the 1680s and 1690s). The secondary literature is accordingly divided on this issue. Robert Adams proposes a thoroughly idealistic interpretation of Leibniz’s metaphysics (see part three of Adams, 1994). Other commentators have detected realistic tendencies regarding corporeal substances in Leibniz’s metaphysics. See, for example, Broad, 1975, pp. 87-90; Garber, 1985 and 1995, pp. 293-98; and Jolley, 2005, pp. 58-63. Glenn Hartz enumerates commitments to idealism and realism in “the five main works” (i.e. *Discourse on Metaphysics*, correspondence with Arnauld, *New System*, correspondence with de Volder, and the *Monadology*) and determines that they have been endorsed 245 and 251 times respectively, with the “approximately even bifurcation” between the two remaining the same all throughout Leibniz’s career (Hartz, 2007, pp. 6-7).

²⁸ On Leibniz’s dynamical view of matter, see Shimony, 2011.

completely established truth that extension is divisible to infinity, and that it is impossible to conceive parts so small as to be unsusceptible of further division,” philosophers who reject the infinite divisibility of bodies “do not impugn this truth itself, but deny that it takes place in existing bodies” by downgrading extension to the status of a merely abstract, ideal property.²⁹ However, the problem of explaining the physical and spatial properties of material bodies which consist of such extensionless, simple substances still remains.

2.2 The Divisibility Problem and the Unification of Metaphysics and Geometry in the *Physical Monadology*

Kant first considers the problem of divisibility in the *Physical Monadology* of 1756. The broad historical context of Kant’s engagement with this problem was the question of the composition of matter, which troubled natural philosophers and metaphysicians in the 17th and 18th centuries.³⁰ The more immediate context was the controversy over the theory of monads between Wolffian metaphysicians and Newtonian thinkers in the Berlin Academy in the 1740s and 1750s.³¹ The Academy made monadology the subject for the prize contest of 1747.³² Kant did not submit a paper, but he did address

²⁹ Euler, *Letters*, p. 216.

³⁰ One of Holden’s major claims in *The Architecture of Matter* is that the problem of the composition of matter posed a significant challenge to the newly emerging scientific worldview and extensively preoccupied modern thinkers. See especially Holden, 2004, pp. 5-9.

³¹ The debate spread beyond the walls of the Academy and attracted the attention of non-professional intellectuals and laymen as well. Leonard Euler, one of the central figures in the debate, vividly depicts the agitation it aroused in the German world: “There was a time when the dispute about monads employed such general attention and was conducted with so much warmth that it forced its way into the company of every description, that of the guardroom not excepted. There was scarcely a lady at court who did not take a decided part in favor of monads or against them. In a word, all conversation was engrossed by monads – no other subject could find admission” (Euler, *Letters*, p. 218).

³² The newly reestablished Berlin Academy was torn between Newtonians and Wolffians. The former were led by the president of the Academy, Pierre Louis Maupertuis, and the Academy’s preeminent mathematician and scientist, Leonard Euler. Despite the fact that Wolff declined King Frederick the Great’s invitation to co-lead the Berlin Academy, Wolffians were still dominant and serving at key

the issue in his *Physical Monadology*. In this text, Kant presented a dynamical model of matter, which he used to dismantle one of the major obstacles to the unification of metaphysics and geometry in philosophy of nature, namely, the problem of the structure and divisibility of material bodies.

Kant begins by considering the relation between a whole and its parts. Proposition 1 defines a simple substance or monad as that which “does not consist of a plurality of parts, any one of which could exist separately from the others” (PM 1:477). That is, a simple substance is an entity that is not actually (either physically or metaphysically) divisible.³³ Proposition 2 then attempts to prove that bodies consist of monads. The proof proceeds as follows.

1. Bodies consist of parts which can exist separately.
2. The composition of the parts is a relation and therefore a contingent property.
3. Hence, the composition can be removed without “abrogating the existence of the things having this relation.”
4. Hence, it is logically possible to remove all composition from a body without eliminating the parts which compose it.

positions in the Academy (e.g. Samuel Formey, the secretary of the Academy). For the prize contest of 1747, scholars were asked to clearly formulate the doctrine of monads and then to decide whether it could be decisively proved or refuted. Anti-monadists objected that monads violated the established law of inertia. To posit that material elements are endowed with spontaneous activity and inner powers capable of altering the states of the bodies which they constitute is at odds with the essential passivity of objects professed by this law. On their view, observed changes in the actual world must be exclusively accounted for by means of external forces. They also argued that the simplicity of monads conflicts with the infinite divisibility of the space occupied by material bodies. It appeared inexplicable to them that infinitely divisible bodies could be constituted by simple substances or elements. An anti-monadist essay won the contest, but the debate was not settled thereby. For detailed historical accounts of the conflict, see Beck, 1969, pp. 314-19; Calinger, 1969; Polonoff, 1973, pp. 77-89; and Laywine, 1993, pp. 27-31.

³³ On Kant’s definition, see Sarmiento, 2005. Sarmiento employs a different terminology, but appeals to ideas similar to Holden’s. Sarmiento effectively distinguishes between that which is “divisible in itself,” that which can be divided by a “cause in nature,” and that which is geometrically divisible. These correspond respectively to Holden’s metaphysical, physical, and formal divisibility.

5. The parts left after the removal of all composition will be without any composition.
6. The parts left will be “completely free from plurality of substances,” that is to say, simple.
7. Therefore, bodies consist of simple parts, namely, monads (PM 1:477).

The proof starts from the fact that bodies have parts which can exist separately. Thus, bodies result from joining independent parts. In the terminology of the *Critique*, this means that bodies are “real composites.” Since combination is a relative, contingent (i.e. not essential) property of the parts, it is possible to eliminate the combination without simultaneously eliminating the parts combined. Hence “all composition of a body can be abolished” and only “absolutely simple fundamental parts” (PM 1:477) are left after all composition is removed.³⁴ Material bodies are thus composed of indivisible, simple parts. In Holden’s terminology, this means that material bodies are finitely metaphysically divisible into simple parts.

Propositions 3 and 4 present the geometer’s perspective, and so focus on space. Kant attempts to geometrically prove that the space which bodies fill is infinitely divisible, and thereof concludes that space does not consist of simple parts. The proof that space is infinitely divisible that Kant employs in the *Physical Monadology* is a

³⁴ Commentators disagree about whether Kant actually succeeded in proving the proposition that bodies consist of monads. Polonoff analyzes Kant’s definition and proof and points out that Kant does not accept the proposition that composite beings are composed of simple elements as an axiom. He also emphasizes that Kant does not resort to the contentious principle of sufficient reason (as for example Wolff did in *Rational Thoughts* §76). To this extent, Polonoff argues, Kant manages to avoid the objections of Euler and the anti-monadists (Polonoff, 1973, pp. 89-90, 148-49). Schönfeld, on the other hand, rejects Polonoff’s claim and contends that Kant’s argument begs the question “by taking for granted that bodies have independently existing parts” and so does not manage to escape Euler’s criticism of the theory of monads (Schönfeld, 2000, p. 169). I address the objection of question begging later with respect to a similar charge made against the proof of the thesis of the second antinomy. Briefly, Kant is not to be taken as setting out from the question begging assumption that material bodies are made up of simple substances but from their conception as “proper” or “real” *composita* as explained above. It seems fair to allow Kant this assumption.

version of a demonstration that recurs frequently in the writings of mathematicians and philosophers of his time. This demonstration is based on the possibility of drawing lines from a given point, through a given finite line, to a perpendicular, infinitely extendable line. It purports to show that every part of space has subparts and that space is, consequently, infinitely formally divisible.³⁵

Propositions 5-7 spell out the apparent conflict and resolve it. It seems that bodies cannot be in space and consist of simple parts at one and the same time. Specifically, it seems that simple parts or elements of bodies cannot fill an infinitely divisible space and still be without parts. Kant's resolution to this problem turns on his insight that filling a space does not necessarily entail being composed of independent parts. Something filling a space must be composite only on the additional assumption that the divisibility of space entails the divisibility of things in space and hence their non-simplicity. In other words, one needs the additional assumption that the formal infinite divisibility of material things entails their metaphysical infinite divisibility.³⁶ If one rejects this further assumption, one can retain both propositions – that bodies are in space and that they consist of simple parts – and thus resolve the conflict. Kant's model of matter allows him to do just this and, in addition, to explain how the spatial properties of bodies result from extensionless monads.

In Kant's model, material elements essentially consist in repulsive and attractive forces. They are not mental entities as in Leibniz's monadology, which means that

³⁵ For a presentation and criticism of this proof, see Holden, 2004, pp. 210-11, 213-18. Holden finds versions of the proof in texts of Antoine Arnauld, Pierre Nicole, Jacques Rohault, Antoine Le Grand, Pierre Bayle, and Benjamin Martin. For Euler's version, see *Letters*, pp. 213-15.

³⁶ In effect, Kant argues from the formal infinite divisibility of material substances to their metaphysical infinite divisibility in his later refutation of the monadology in the *Metaphysical Foundations of Natural Science*, chapter 2, proposition 4.

they are not involved in mental activities such as perception and appetite.³⁷ Kantian elements therefore possess physical properties, just like the material bodies they constitute, and are accordingly dubbed *physical* monads.³⁸ An element fills a space and prevents others from entering it by means of its repulsive force or impenetrability. The repulsive force emanates from the element and spreads indefinitely in space, its intensity diminishing in proportion to the distance from its source. That is, the closer something is to the point of radiation, the stronger the repulsive force is (repulsion is infinitely strong at that point, making complete penetration impossible). If material elements possessed only repulsive forces, there could be no material *bodies*, since the elements would then only repel one another, rather than join together to constitute composite objects with determinate shapes or surfaces. Therefore, there must be an opposite, attractive force which limits the effect of the repulsive force and enables the cohesion of multiple elements. A cohesive group of elements constitutes a composite material body with a determinate shape and volume.³⁹

The interplay of the repulsive and attractive forces of elements defines the limit of the extension of a composite body (i.e. its shape and volume) in the following way. Both forces of a material element emanate from the center point and extend indefinitely while diminishing with distance. At greater distances, the force of attraction is stronger than the repulsive force. The element thus draws remote elements closer and closer. There is a point at which the element's repulsive and attractive forces are in equilibrium. At every point between the equilibrium point and

³⁷ See for example: "considering the matter carefully, it may be said that there is nothing in the world except simple substances and, in them, perception and appetite. Matter and motion, however, are not so much substances or things as they are the phenomena of percipient beings, whose reality is located in the harmony of percipient with himself (at different times) and with other percipient beings" (letter from Leibniz to de Volder, June 30, 1704, L 537).

³⁸ In the *Metaphysical Foundations* Kant names the monadist's elements of matter "physical points" (MF 4:504).

³⁹ See PM, proposition 10, 1:483-85.

the element, the force of repulsion prevails, and the element pushes other elements away from it. At the exact point at which the element's forces of attraction and repulsion are equal, other elements are neither attracted nor repelled, but rather remain steadily adjacent to it. The set of equilibrium points defines the limit of the spatial extension of the element.⁴⁰ A finite group of such contiguous elements with definite shape and volume form a composite material body.⁴¹

Kant contends that his model of matter resolves the divisibility conflict by showing that a material element is both metaphysically indivisible and infinitely formally divisible. Consider a point-like element that fills a particular spherical region of space by exerting its forces throughout this space. Suppose further that a vertical plane bisects this space into two equal hemispheres. It can be said that the right hemisphere is outside the left one and thus that this region of space contains two spatially distinct parts. That is, we have *formally* divided the element's sphere of presence. But we have *not* thereby *metaphysically* divided the element, since the two hemispheres are not separate substantial parts of the element itself; what is present on

⁴⁰ In so far as Kant's model concerns the possibility of matter, the essential points are that matter consists in repulsive and attractive forces and that repulsion diminishes with the distance at a greater rate than attraction. The specific details of the laws that govern the forces are not essential to the model. Nevertheless, Kant conjectures about the mathematical formulas of the forces. He links repulsion with the space or *volume* which the element fills and attraction with the spherical *surface area* toward which the force is exerted, and concludes that the former is in inverse proportion to the cube of the distance while the latter is in inverse proportion to the square of the distance.

⁴¹ Kant's dynamical model of matter is similar to the system of his contemporary, the Croat natural philosopher and Jesuit priest, Roger Boscovich. In his 1758 *Theory of Natural Philosophy* (third, revised edition in 1763), Boscovich elaborates a system of point particles exerting forces on each other and composing material bodies. The main difference between the systems of Kant and Boscovich is that Boscovich postulates one unified force with changing influence instead of an interplay of two distinct forces. According to Boscovich's force law, the force projected by a point particle repels at very short distances and increases infinitely as the distance diminishes infinitely. At somewhat farther (but still rather short) distances, the force varies between repulsion and attraction in a wave-like manner. At greater distances, the force attracts and weakens with the distance in accordance with Newton's inverse square law of attraction (*Theory of Natural Philosophy* §§7-15). The Kant-Boscovich model of matter is of historical importance as the forerunner of 19th century field theories and certain dynamical conceptions of matter in modern physics. For a systematic survey of the Kant-Boscovich model of matter, see Holden, 2004, chap. 6 – "The Kant-Boscovich Force-Shell Atom Theory." See also Jammer, 1962, chap. 9 – "Dynamism: Leibniz, Boscovich, Kant, Spencer"; Hankins, 1965, pp. 291-97; Edwards, 2000, pp. 103-05.

both sides of the dividing plane are not different pieces of the point-like element. Rather, what is present there and thereby divided is the “sphere of activity” of the element. The element does not fill the two hemispheres by positing in them its substantial parts, since the element does not possess any substantial parts. Instead, the element fills them by exercising its activity within them. In this case, “filling space” means, for example, that by virtue of this activity, the element would hinder to a certain degree two other elements, placed on its opposite sides, from drawing closer and closer toward each other. Thus, if we wish to assert the actual divisibility of the physical element itself, we have to affirm not that it has substantial parts, but rather that it is somehow possible to distance the two hemispheres from one another. However, such a separation of the hemispheres is impossible. Each hemisphere radiating from the point-like element is nothing but its field of action or the effect of its forces. Because both are dependent on the element and draw their subsistence from its activity, it is neither physically nor logically possible to dissociate them from their source and set them apart from one another. Therefore, the physical monad is not actually divisible, but only infinitely formally divisible. Consequently, composite bodies are finitely actually divisible into simple parts and infinitely formally divisible.⁴²

Schönfeld finds the alleged physical and metaphysical indivisibility of the sphere of activity of a monad objectionable.

[Kant] maintained that it is impossible to break a monad into two. Because the extensive magnitude belongs to the monad and is sustained by it, it is equally impossible to subject the extensive magnitude of the monad to division. The ‘space’ the monad occupies might be geometrically bisectable, but that the extensive magnitude of the monad itself should be divided

⁴² For a similar reading, see Holden, 2004, pp. 244-48.

into two, separably movable, and mutually repelling spheres cannot be. Nonetheless, the sphere of activity of the monad is an extensive magnitude in a literal sense: *it has extension*. Hence, it *must be subject to division*, despite Kant's remarks to the contrary. The force field is spatially describable in a literal way: it has a center, it has a three-dimensional volume, and it has an external, shell-like boundary. These properties of the force field are the spatial segments of the monad's extensive magnitude. *This entails that the monad is naturally divisible.*⁴³

In essence, Schönfeld argues that the monad's formal divisibility entails its actual divisibility. His objection thus hangs on the assumption that formal divisibility entails actual divisibility, but he provides no support for this assumption. He simply infers that a monad must be subject to actual division from the fact that it has extension. On his reading, Kant's "argument that the monad could not be divided because the force field was neither a literal part nor an essential property begged the question."⁴⁴ Kant's intention in propositions 5-7, however, is *not* to prove that a monad cannot be divided. In proposition 1, Kant defines the monad as that which "does not consist of a plurality of parts." Proposition 2 was supposed to prove that "bodies consist of monads." In propositions 5-7, Kant addresses the problem of how it is possible for a monad to fill a space without losing its simplicity, *given that* it is metaphysically indivisible *and that* space is infinitely formally divisible. He suggests that his dynamical model of matter can provide the requisite answer.

As we have seen, formal divisibility entails actual divisibility if one adopts an absolutist view of space,⁴⁵ namely, if one regards space as a condition of the possibility of bodies and if extension is, therefore, understood as a primitive property of bodies. But to assume that space is prior to physical substances and, therefore, that

⁴³ Schönfeld, 2000, p. 171, italics added.

⁴⁴ Ibid.

⁴⁵ We have also seen that formal divisibility entails actual divisibility if one identifies space and matter. However, proponents of both sides of the dispute reject this identification.

formal divisibility entails actual divisibility is, in fact, to beg the question against the metaphysician of the *Physical Monadology*. Further, although Kant had previously endorsed a relational view of space in *Living Forces* and *New Elucidation*, he does not presuppose relational space in the argument of the *Physical Monadology*. Rather, the notion of relational space is part of Kant's strategy for resolving the debate between metaphysics and geometry, given that the core theses of both positions have been established in propositions 1-4.⁴⁶ The view that space is relational and derivative (i.e. that it depends on substances and not the other way around), allows Kant to reject the inference from formal to actual divisibility, and thus to resolve the conflict. This is not to claim either that Kant sufficiently establishes the core theses of metaphysics and geometry in propositions 1-4 or that his model is equally acceptable to both sides. It is merely to exonerate Kant's argument from the charge of question begging.

2.3 The Conflict between the Dynamical Model of Matter and the Conception of Space in *Directions in Space*

In the *Physical Monadology*, Kant affirms that simple parts are the conditions of composite objects and conceives of space as real and relational. This means that matter is finitely actually divisible and infinitely ideally divisible. This account may

⁴⁶ One may be tempted to identify Kant's argument with Leibniz's strategy of untangling the paradox of divisibility by rejecting the reality of space (on Leibniz's strategy, see Holden, 2004, pp. 62-64). One should resist this temptation, however, since Kant's conception of space is different from Leibniz's. Like Leibniz, Kant construes space as relational, but, unlike Leibniz, he does not take the relationality of space to imply its ideality. For Kant, space is real, since it is derived from actual interactions between substances, not from ideal relations between windowless monads. Commentators have noted this point. Schönfeld maintains that whereas downgrading the reality of space allows Leibniz to deny that matter is infinitely divisible and thus to avoid the problem, Kant refuses to give up the reality of space (Schönfeld, 2000, pp. 166-67). Shell similarly argues that while Leibniz's resolution to the difficulty rests on entirely disconnecting space and substantiality, Kant, despite approaching this position, nevertheless suggests a different view that affirms both the simplicity of substance and the reality of the infinitely divisible space (Shell, 1996, pp. 76-80).

satisfy supporters of the metaphysical approach, but not proponents of the mathematical approach. For the latter, primitive, absolute space is an essential feature of the new, scientific worldview.

According to the absolutist view of space advanced by the mathematical approach, space is an existent in itself and has some kind of independent reality. Space is a condition of the existence and structure of matter; matter exists in space and assumes the structure of space. Extension is therefore a primary, primitive property of matter (not merely a derivative, relational one). Consequently, matter is not composed of indivisible parts, but is rather divisible to infinity. In a word, on this view of space, the infinite formal divisibility of matter (i.e. the infinite divisibility of the space filled by matter) entails its actual infinite divisibility.

Kant shifts to an absolutist, Newtonian conception of space in his 1768 *Directions in Space*. This is perhaps the only text in which he espoused a genuinely Newtonian view of space. Kant declares in the opening paragraph of *Directions in Space* that he aims to provide a proof for the existence of an absolute space which is “the ultimate foundation of the possibility of the compound character [*Zusammensetzung*] of matter” (DiS 2:378). This means that in this text, Kant takes the infinitely divisible space as the ultimate condition of the structure of the matter which occupies it. And as we have seen, this implies that the infinite formal divisibility of matter entails its infinite actual divisibility.

The problem, however, is that Kant endorses an absolutist conception of space without simultaneously modifying his doctrine of physical monadology.⁴⁷ His

⁴⁷ Kant did not systematically reconsider the structure of matter until the Inaugural Dissertation of 1770. His writings from the early 1760s are mainly concerned with the methodology of metaphysics (and of mathematics and science) and less with the metaphysics of nature. The *Only Possible Argument* is an exception, but this text deals with arguments for the existence of God and the order of nature, not with the character of material elements of which the physical world consists. In any case, Kant

physical monadology is inconsistent with an absolutist view of space, since it affirms the finite actual divisibility of matter while the latter implies infinite *actual* (and not merely *formal*) divisibility of matter. Kant had to modify either his view of space⁴⁸ or his doctrine of matter,⁴⁹ but he did neither. *Directions in Space* does not address the subject, nor hint at an alternative theory of physical reality that could resolve the problem. Since the problem of interpreting Kant's view of space in *Directions in Space* is essential to my line of argument, I conclude this section by considering challenges to the standard reading of *Directions in Space* as advancing an absolutist, Newtonian conception of space.

nowhere rejects the dynamical model of matter, and certain remarks in the writings of the 1760s show that he still adheres to this model (See *Negative Magnitudes* 2:179-80; *Inquiry concerning the Distinctness of the Principles of Natural Theology and Morality* 2:286-87; *Dreams of a Spirit-Seer* 2:323-24). The doctrine of physical monads, therefore, remains his considered position concerning the fundamental building blocks of the material world.

⁴⁸ Boscovich's view of space may fit Kant's doctrine of matter well. Boscovich is reluctant to enter the conundrum of the nature of space and time, since he thinks "that this is merely a question of terminology" (*Theory of Natural Philosophy* §142). Nevertheless, he makes some contentious claims on the matter. On his account, local and temporal properties of actual material substances are real modes of existence of points of matter. "Any point [of matter] has a real mode of existence, through which it is where it is; and another, due to which it exists at the time when it does exist. These real modes of existence are to me real time and space" (ibid., supplement 1, p. 197). Since real time and space are nothing but these modes of existence of actual points of matter, and since, further, matter in Boscovich's theory is composed of indivisible points and does not continuously extend, real time and space are also not *continua*. When we abstract from the actual points of matter and conceive the *possibility* of interposing as many points as we like between any two given points, we form for ourselves the idea of an *imaginary* continuous space (ibid., p. 198). Thus he concludes: "I recognize no coexisting continuum... for, in my opinion, space is not any real continuum, but only an imaginary one" (ibid. §142). The decisive feature of Boscovich's theory is therefore the priority of matter over space. Discrete points of matter are the fundamental elements of Boscovich's account. Everything else depends on them and the force law which governs their activity. Thus, even though Boscovich wishes to stay away from the dispute regarding the nature of space, his theory implies a version of a relational view of space, one that, moreover, entails the non-continuous character of space from the character of material points.

⁴⁹ In the *Metaphysical Foundations of Natural Science*, Kant proposes a different theory of matter and its composition, one which accords with his conception of space as a condition of physical objects. According to his theory in the *Metaphysical Foundations*, every part of a given filled space contains the repulsive force by which it is filled. Because material substance consists in forces, every part of a filled space contains material substances. In every part of a filled space, there is something "movable, and thus separable from the rest as material substance through physical division." Therefore, "the possible physical division of the substance that fills space extends as far as the mathematical divisibility of the space filled by matter" (MF 4:503-04). Because the latter extends infinitely, so does the former. This means that in the *Metaphysical Foundations*, consistent with his conception of space as a condition of physical objects, Kant conceives of material bodies as infinitely actually divisible and not as consisting of a finite number of physical monads as in the *Physical Monadology*.

2.3.1 Challenges to the standard reading of *Directions in Space*

Kant's *Directions in Space* is standardly interpreted as an attempt to prove the existence of a Newtonian absolute space. However, Michael Friedman and Martin Schönfeld have recently challenged the standard interpretation. They argue that in *Directions in Space* Kant indeed excludes a Leibnizian relational space, but does not endorse instead a Newtonian absolute space. On their reading, Kant argues for the autonomy or independence of space of the material world. But whether Kant's autonomous space is objective or subjective remains an open question. Leaving open the possibility that space is subjective means, as Friedman puts it, that space may have "autonomous reality, not as a self-subsistent independent object in the manner of Newton, but rather as an autonomous form of sensible intuition," as Kant presents it in the Inaugural Dissertation.⁵⁰ Friedman and Schönfeld base their claim on three grounds. First, they emphasize the fact that Kant distances himself from Euler's argument for the existence of Newtonian absolute space. Second, they argue that Kant refrains from adopting absolute motion, which they take to mean that Kant is not interested in a Newtonian space. Finally, Friedman emphasizes the subjective tone of Kant's claim that "absolute space is not an object of outer sensation; it is rather a fundamental concept which first of all makes possible all such outer sensation" (DiS 2:383).

Consider the passage in which Kant announces his purpose in *Directions in Space*.

My purpose in this treatise is to see whether there is not to be found in the intuitive judgements about extension such as are to be found in geometry, clear proof that: *Absolute space, independently of the existence of all matter and as itself the ultimate foundation of the possibility*

⁵⁰ Friedman, 1992, pp. 28-30; Schönfeld, 2000, p. 289, note 6.

of the compound character of matter, has a reality of its own. Everybody knows how unsuccessful the philosophers have been in their efforts to place this point once and for all beyond dispute, by employing the most abstract judgements of metaphysics. Nor am I familiar with any attempt to attain this end so as to speak *a posteriori*... apart, that is, from the treatise of the illustrious Euler the Elder, which is to be found in the *Proceedings of the Berlin Royal Academy of Sciences* for the year 1748. This treatise, however, does not quite achieve its purpose. It only shows the difficulties involved in giving a determinate meaning to the universal laws of motion if one operates with no other concept of space than that which arises from abstraction from the relation between actual things. It does not, however, consider the no less serious difficulties which arise if, in applying the laws just mentioned, one attempts to represent them *in concreto*, employing the concept of absolute space. The proof, which I am seeking here, is intended to furnish, not engineers [*Mechaniker*], as was Euler's purpose, but geometers [*Mefßkünstler*] themselves with a convincing argument which they could use to maintain, with the certainty to which they are accustomed, the actuality of their absolute space (DiS 2:378).

The passage indeed contains an ambiguity. On the one hand, Kant maintains that the absolute space whose existence he wishes to prove has “a reality of its own” (*eine eigene Realität*) and that he wants to show its “actuality” (*Wirklichkeit*). This may seem to suggest that Kant, like Newton, takes space to be a thing which has its own mode of independent existence. On the other hand, Kant emphasizes that absolute space has its own reality “independently of the existence of all matter” without similarly stressing that it is also independent of thinking subjects. This, together with Kant's later remark that absolute space is a fundamental concept which makes outer sensation possible, may be taken to support the Friedman-Schönfeld reading of autonomous space as independent of the material world alone.

The ambiguity can, at least to a certain extent, be removed if we take into account the development of Kant's view of space. If Kant were to argue for objective, absolute space after 1781, when he had already articulated the subjective conception of space

as transcendently ideal, we would indeed expect the double emphasis, namely, that space is independent of both material objects and thinking subjects. But this was not the case in 1768. After two decades of adherence to relational view of real space, it was only reasonable for Kant to *then* stress that he no longer regarded space as constituted by relations between objects.⁵¹ It was unnecessary to emphasize the rejection of a subjective conception of transcendently ideal space as that put forward in the Dissertation and the *Critique*, since until then Kant had not treated such a conception as a live option.⁵² It is noteworthy that once subjective space became an option for Kant, he explicitly distinguished the subjective version of autonomous space not only from Leibnizian relational space, but also from Newtonian absolute space.⁵³ Further, Kant's claims that absolute space is not an object of outer sensation and that it is a fundamental concept which makes outer sensation possible do not by themselves indicate that space is subjective. One can simultaneously hold that space is

⁵¹ In the *Inquiry concerning the Distinctness of the Principles of Natural Theology and Morality* (the Prize Essay of 1764), Kant remarks that the manifold (*Viele*) in space "is not constituted by substances" (*Inquiry* 2:281). Although this claim may seem to imply that Kant discards the relational view of space, it need not be understood in this way. The context in which Kant makes this remark is a discussion of the difference between mathematics and philosophy with respect to the fundamental elements of cognition (unanalysable concepts and indemonstrable propositions), and not in the context of a discussion of the physical reality and its relation to space. Kant uses the notion of space to illustrate how philosophers should proceed to analyze a given concept with the help of basic data received from other sources. In this case, the other source is geometry. Kant thus treats space abstractly as a geometrical manifold without providing an account of its ontological status. See also *Negative Magnitudes* 2:168.

⁵² David Walford similarly maintains that it is merely a matter of emphasis: "Both Euler and Kant claim to have established the falsity of Leibnizian Relationalism (the former by showing its incompatibility with an *indubitably certain principle of natural science*, the principle of inertia; the latter by showing its incompatibility with an *indubitably certain fact of experience*, the incongruency of incongruent counterparts), and, thereby, to have established the truth of Newtonian Absolutism, Euler emphasizing that absolute space has a real and objective existence independent of the existence of mind, Kant emphasizing that absolute space has a real and objective existence independent of the existence of matter" (Walford, 1999, p. 328).

⁵³ Cf. Diss §15, 2:403-04: "*Space is not something objective and real*, nor is it a substance, nor an accident, nor a relation; it is, rather, subjective and ideal... Those who defend the reality of space either conceive of it as an *absolute* and boundless *receptacle* of possible things... or they contend that it is the relation itself which obtains between existing things, and which vanishes entirely when the things are taken away, and which can only be thought as being between actual things." It is interesting to note the significant difference between the treatment of space in section 15 of the Dissertation and that of *Directions in Space*, in particular in light of the fact that both texts include a similar argument from chirality or incongruence. See also A39-40/B56-57.

objectively absolute and that it is inaccessible to our senses. That space is a condition of outer sensation can be taken to mean that it is an ontological condition of external objects which we perceive through outer sensation.

Furthermore, consider again Kant's reference to Euler's *Reflections on Space and Time*. In this essay Euler attacks the metaphysicians' claims that space and time are relational and ideal and that the ideas of space and time are "imaginary and destitute of all reality." He attempts to show by means of Newton's laws of motion that "there is such [a] real thing in the world, which corresponds to that idea [i.e. the idea of place]," that "[t]here is... in the world, outside of the bodies which constitute it, some reality, which we represent to ourselves by the idea of place," and that "time [is] something real, which exists not only in our mind, but which actually flows in serving as a measure of the duration of things."⁵⁴

Like Euler, Kant attempts to show that absolute space has "a reality of its own" and to prove its "actuality." Kant expresses his dissatisfaction with the *proofs* hitherto offered by Euler and others in support of absolute space, but shows no reservation as to *what they set out to prove*. The philosophers' *a priori* arguments from metaphysics and Euler's *a posteriori* proof from physics both fail to achieve the goal of establishing the existence of absolute space. Kant nowhere claims that earlier attempts by philosophers and physicists failed because they pursued the wrong goal, namely, that they failed because they aimed to establish the existence of space as an independent entity. Nor does Kant suggest that he will argue for a different conception of space. Furthermore, in the concluding paragraph of his treatise, Kant

⁵⁴ Euler, *Reflections on Space and Time*, pp. 117, 121, 123. Ronald Laymon argues that Euler's argument is of the same kind as those introduced by Newton in his bucket and two globes thought experiments in the *Principia*. Like Newton's thought experiments, Euler's argument provides indirect support for the existence of absolute space by demonstrating that this conception of space is part of a successful scientific theory. See Laymon, 1978, pp. 410-11, and note 23.

expresses his wish that the “reflective reader” will not “dismiss the concept of space, as it is construed by geometers and as it has also been incorporated into the system of natural science by penetrating philosophers” (DiS 2:383). The “penetrating philosophers” are presumably preeminent figures such as Newton and Euler. Unlike Euler, however, Kant intends to prove the existence of absolute space not by means of *a posteriori* arguments from empirical laws, but by *a priori* considerations from geometry. In this way, Kant aims to establish the existence of absolute space in a manner that will satisfy even the geometers, who typically require strict standards of demonstration. More specifically, Kant seeks to prove absolute space *a priori* from reflections on the distinct spatial phenomenon of chirality.⁵⁵ The broader context for this endeavor is thus Leibniz’s geometry of situation (*analysis situs*), not Newton’s laws of motion.⁵⁶ Thus, Kant does not refrain from accepting absolute motion; rather, he does not consider motion in general, since it is irrelevant to the context of the discussion.

To conclude, Kant’s goal in *Directions in Space* is to assist the cause of thinkers such as Euler who have tried to prove the existence of objective absolute space. He aims to provide a better argument than the inadequate ones they presented.⁵⁷ Whether or not Kant succeeded is another question. The point is that in 1768, Kant regards space as a real entity that subsists independently of material objects and thinking subjects alike, just as Euler and those philosophers to whom he refers in the passage quoted conceived it. However, this conception implies that bodies are infinitely *actually* divisible, which conflicts with Kant’s doctrine of physical monadology.

⁵⁵ For a clear mathematical exposition of chirality, see Huggett, 1999, pp. 203-08.

⁵⁶ On how and to what extent Leibniz’s unpublished *analysis situs* became known to scholars of the 18th century, see De Risi, 2007, pp. 94-111, esp. pp. 107-11.

⁵⁷ Or as Polonoff puts it, Kant “amplifies” Euler’s argument: “Kant amplifies... the argument used by [Euler] in connection with mechanics. This amplification involved adding arguments to convince geometers” (Polonoff, 1973, p. 92, note 56).

2.4 The Inaugural Dissertation's Analysis of the Divisibility Problem

The Inaugural Dissertation of 1770 (*On the Form and Principles of the Sensible and the Intelligible World*) marks a substantial moment on the way toward a critical rendering of the conflicts over the size and division of the world and toward construing them as antinomies. It opens with a general analysis of the notion of a world. The analysis indicates the questions of the size and composition of the world as two problems which beset a coherent concept of the world. In the Dissertation, Kant suggests resolving the problem by positing a separation between the sensible and the intelligible worlds. In other words, in the Dissertation, Kant discards his vision from the *Physical Monadology* of uniting metaphysics and geometry and instead advances a doctrine which distinguishes two separate realms of reality: one of monads or substances, the other of physical objects.⁵⁸ Kant's primary motivation for advancing the separation doctrine stems from his attempt to deal with the questions of the size and division of the world, namely, the problems which are presented in the *Critique* as mathematical antinomies. The Dissertation thus constitutes an essential milestone on the way to the critical treatment of the antinomies. In this section, I examine the analysis and solution of the divisibility problem presented in the Dissertation by means of the separation doctrine. I also consider Guyer's interpretation of the place of the "subreptic axioms," an essential feature of the separation doctrine, in the development of Kant's approach to the antinomy.

⁵⁸ Schönfeld understands the general strategy of the Dissertation in a similar way: "If metaphysics and science cannot be married through a unified philosophy of nature, then so be it. Apparently, it is better to consider reality as comprising two incommensurable spheres – a 'sensible world' described by natural science, and an 'intelligible world' explored by metaphysics. This move, made in... the *Inaugural Dissertation*, was Kant's first big step toward the critical philosophy" (Schönfeld, 2000, p. 184).

2.4.1 The analysis of the concept of a world

In the opening section of the Dissertation, Kant analyzes “the concept of a world in general.” Here, Kant specifies three essential elements in the definition of a world: matter, form, and entirety. Matter is understood “in the transcendental sense,” namely, in the abstract sense of constituents or parts which make up the world (i.e. substances), not in the empirical sense of the stuff of physical bodies (Diss §2, 2:389). Form “consists in the coordination... of substances” (Diss §2, 2:390). The coordination is real and objective, not ideal and subjective. That is to say, there are actual relations and interactions among the constituents of the world. Thus far, we have arrived at a notion of a world already presented in earlier texts, namely, a system of substances coordinated through actual interaction.⁵⁹ The third factor that Kant explicitly emphasizes in the definition of the Dissertation is entirety, or “the *absolute* totality of [the world’s] component parts” (Diss §2, 2:391). The world and its simple constituents are antipodes. Just as an analysis of a composite is completed only by arriving at parts which are not wholes (i.e. simples), so the synthesis of parts is completed only with a whole which is not a part (i.e. a world). In sum, a world is a system of interacting substances which is not part of a more comprehensive system.

Kant’s definition of the world in the Dissertation gives rise to the problems of the mathematical antinomies: the size of the world in its entirety and the decomposition of the world into simple constituents. On the one hand, conceptual considerations demonstrate that the world is both bounded and composed of simple parts. On the other hand, physical objects are continuous and extend indefinitely in space and time,

⁵⁹ In *Living Forces*, Kant defines a world as “a being whose constituents are actually interconnected” and claims that “by definition, only that which stands in an actual connection with the other things which are in the world can be reckoned as belonging to the world” (LF §8, 1:22-23, HK 9). See also NE 1:414.

since the physical universe is conditioned by space and time and the latter are infinite and continuous magnitudes.⁶⁰ With respect to divisibility, one can prove by means of conceptual considerations that composite objects consist of simple parts. By removing the concept of composition from that of a composite object, one arrives at its simple constituents. But one cannot represent simple parts of continuously extending objects in space.

As a first step toward resolving the issue, Kant emphasizes that there are two ways of referring to the notions of composites and simples: by intellectually conceiving them with the general concepts of composition and division, and by concretely representing them in intuition.

... when a substantial compound has been given, we arrive without difficulty at the idea of things which are simple by taking away generally the concept of *composition*, which derives from the understanding. For the things which remain when every element of conjunction has been removed are *simple* things. However, under the laws of cognitive intuition, this only happens, that is to say, all composition is only cancelled, by means of a regress from the given whole to all its *possible parts whatsoever*, that is to say, by means of analysis, which in its turn rests upon the condition of time (Diss §1, 2:387-88).

We can *think* of the composite as composed of simple parts, but we cannot *represent* the simple parts in sensitive intuition. We have to concretely continue the analysis of a composite object by successively representing its division in intuition. But we represent objects in space, and this means that, like space itself, objects are continuous. And because continuous magnitudes can always be further divided, the process of division has no limit. Consequently, we never arrive at simple parts.

⁶⁰ See Diss §1, 2:388; §14, 2:399-400; §15, 2:403, note; 2:405; 2:410.

Kant warns against drawing the wrong conclusion from the lack of accord between what can be intellectually thought or proved and what can be represented in intuition. In particular, it would be a mistake to conclude that the notions of infinity, absolute totality, continuity, and simples are impossible. Kant stresses the difference between objective impossibility and sensitive unrepresentability. Whatever conflicts with the principles of the intellectual faculty is objectively impossible. Alternatively, things which we cannot represent in intuition are not, for that reason, impossible in themselves. This only points to our subjective limitations. The fact that we cannot represent simple parts does not mean that objects in themselves do not consist of simple parts. It only means that objects as given to us in sensitive intuition are infinitely divisible. Composite objects in themselves do indeed consist of simple parts, since the understanding can establish this fact by means of conceptual considerations. And yet, physical objects given to us in intuition are infinitely divisible, since they are conditioned by space. The puzzle is thus resolved if we distinguish two types of objects and correspondingly two types of cognitive reference to objects.

2.4.2 The doctrine of separation of the sensible and intelligible

Kant's preliminary analysis of the concept of the world and the problems it implies lead him to distinguish, in section 2 ("The distinction between sensible things and intelligible things in general"), two types of objects (i.e. sensible and intelligible) and two cognitive faculties through which they are known (i.e. sensibility and understanding, respectively). The doctrine of the separation between the sensible and the intelligible is the key to the resolution of the problems implied in the notion of the world. My examination of Kant's doctrine in this section elucidates how this doctrine

provides a solution to the divisibility problem and will later serve to expose the shortcomings of this solution.

Sensible things (phenomena) are objects known through sensibility. Similar to his treatment of this issue in the *Critique*, in the Dissertation Kant characterizes sensibility as receptivity, or the capacity to be affected by an object.⁶¹ Sensitive cognition of phenomena thus depends on the particular manner in which the subject can be affected by objects.⁶² This type of cognition is therefore subjective and thus represents things as they appear. Intelligible things (noumena) “cannot by their own quality come before the senses of [the] subject,” and are cognized through the intellectual faculty (Diss §3, 2:392).⁶³ Intellectual cognition “is exempt from such subjective conditions” and refers to things as they are (Diss §4, 2:392).

Sensibility and understanding also differ in their modes of representing and types of representations. We *intuit* objects through sensibility. Our intuition of an object is *singular* and *immediate*. That is, we refer directly to a particular object through sensitive intuition. We do not have a similar “*intuition* of what belongs to the understanding, but only a *symbolic cognition*.” We can only *think* of intelligible things by means of *general* representations, namely, concepts (Diss §10, 2:396-97).⁶⁴ In this distinction, Kant distances himself from Leibniz and Wolff’s view of the distinction between sensitive and intellectual representations. According to Kant, for Leibniz and

⁶¹ Compare Kant’s characterization of sensibility in the Dissertation as “the receptivity of a subject in virtue of which it is possible for the subject’s own representative state to be affected in a definite way by the presence of some object” (Diss §3, 2:392) with his claim in the Aesthetic that the “capacity (receptivity) to acquire representations through the way in which we are affected by objects is called sensibility” (A19/B33).

⁶² Again, as he does in the Aesthetic, Kant demonstrates in section 3 in the Dissertation that time and space are the subjective conditions of sensitive cognition.

⁶³ In contrast to his treatment of this issue in the *Critique*, in the Dissertation, Kant does not present the understanding and reason as two different intellectual faculties. Instead, Kant here uses the terms “intelligence” (*intelligentia*), “understanding” (*intellectus*), and “reason” (*ratio*) to signify the intellectual as opposed to the sensible faculty.

⁶⁴ Cf. A67-69/B92-94 and A320/B376-77.

Wolff the distinction is merely logical and turns on degrees of distinctness. Sensitive and intellectual cognitions represent one and the same thing: the former confusedly, the latter distinctly.⁶⁵ Kant, by contrast, bases the distinction on the origin of the representations. A sensitive representation belongs to sensibility, an intellectual to the understanding; they are different in kind and refer to different objects. Each may be confused or distinct, yet always “preserves the sign of its ancestry” (Diss §7, 2:394-95).

A further relevant feature of the separation doctrine is a distinction between two uses of the understanding: real use and logical use. The understanding in its real use is a source of concepts of objects and relations. These concepts contain no sensitive element and are not abstracted from experience.⁶⁶ Kant offers possibility, existence,

⁶⁵ Kant similarly argues in the *Amphiboly*: “the famous Leibniz constructed an **intellectual system of the world**... The conditions of sensible intuition, which bring with them their own distinctions, he did not regard as original; for sensibility was only a confused kind of representation for him, and not a special source of representations; for him appearance was the representation **of the thing in itself**... In a word, Leibniz **intellectualized** the appearances, just as Locke totally **sensitized** the concepts of understanding in accordance with his system of **noogony** (if I am permitted this expression), i.e., interpreted them as nothing but empirical or abstracted concepts of reflection. Instead of seeking two entirely different sources of representation in the understanding and the sensibility, which could judge about things with objective validity **only in conjunction**, each of these great men holds on only to one of them, which in his opinion is immediately related to things in themselves, while the other does nothing but confuse or order the representations of the first” (A270-71/B326-27). What is still missing in the *Dissertation* is the “conjunction” of sensibility and understanding, which alone, according to the *Critique*, can yield objective knowledge.

Leibniz’s “*Meditations on Knowledge, Truth, and Ideas*” (1684) can provide some support for Kant’s reading. Leibniz explains that we can have clear or obscure knowledge of a thing. We have obscure knowledge when we cannot recognize the thing and distinguish it from others; we have clear knowledge when we can recognize it. Our clear knowledge of a thing can be either confused or distinct. We have *confused* knowledge when we cannot enumerate the marks sufficient to distinguish it from others. We have *distinct* knowledge when we can enumerate these sufficient marks. Sensory perception is confused, because although we can recognize objects known in this way, we cannot identify their sufficient marks: “Thus we know colors, odors, flavors, and other particular objects of the senses clearly enough and discern them from each other but only by the simple evidence of the senses and not by marks that can be expressed.” By contrast, we have distinct “concepts about objects common to many senses, such as number, magnitude, and figure.” Leibniz clarifies in the *New Essays* that distinct concepts which are “common to many senses,” come “from the mind itself; for they are ideas of the pure understanding” (“*Meditations*,” L 291-92; *New Essays* 2.5). In short, sensory perception is confused, while intellectual representation is distinct, and there is no further suggestion that they differ in kind. Dascal (1985) challenges Kant’s reading of Leibniz in the passage quoted above.

⁶⁶ See Diss §6, 2:394.

necessity, substance, and cause as examples of pure concepts of the understanding.⁶⁷ One function of the concepts of the understanding is negative, that is, “they keep what is sensitively conceived distinct from noumena” and thereby guard us against errors in our metaphysical knowledge of things as they are (Diss §9, 2:395). At the same time, the logical use of the understanding allows a limited interference of the intellectual faculty in the investigation of the phenomenal world. In this function, the understanding organizes concepts, whatever their source may be. It compares concepts and subordinates them to one another in hierarchies of genera and species. In particular, the understanding in its logical use organizes sensitive cognitions by subordinating phenomena under more general empirical concepts and laws. Kant emphasizes that empirical concepts and laws processed in this way will always remain sensitive: however general they are made by the logical use of the understanding, they will never become intellectual. “Thus,” Kant concludes, “*there is a science of sensory things*, although, since they are phenomena, the use of the understanding is not real but only logical” (Diss §12, 2:398).

This conceptual apparatus provides the means to solve the conflicts involved in the notion of a world. These conflicts arise when features of objects of different classes are mixed. The solution is therefore to keep the two realms apart. In the case of divisibility, it allows one to hold that actual finite divisibility of intelligible things into simple parts can be proved from conceptual considerations, and that actual infinite divisibility of physical objects into ever smaller divisible parts can be established on the basis of the conditions of sensitive cognition. In short, by keeping the two realms apart, one may coherently hold that things as they are consist of simple

⁶⁷ Diss §8, 2:395. Compare Leibniz’s list in the *New Essays*: “the soul includes being, substance, one, same, cause, perception, reasoning, and many other notions which the senses cannot provide” (*New Essays* 2.1.2).

parts and that physical objects are infinitely divisible and thus do not consist of simple parts.

The methodological remarks of the concluding section of the Dissertation serve to solidify the separation intended to resolve the problems in the concept of the world. Kant is particularly concerned that empirical, sensitive cognition might taint metaphysical cognition and that what is only subjectively valid of phenomenal objects would then be taken as true of objects in general. Kant elaborates on this fallacy in a more technical manner by means of an analysis of the structure of propositions which result from such illicit mixture of standards.

When a predicate, which is a sensitive concept, is assigned in a judgment to a subject, which is a concept of the understanding, a feature that pertains to objects as they appear to us in conformity with our subjective forms of sensibility is taken as objectively applicable to things as they are. The proposition “whatever exists, is somewhere” is an example of such an unlicensed judgment. In this judgment, the concept of the subject (existence) is intellectual and that of the predicate (being somewhere) is sensitive. The subjective condition of human empirical cognition, according to which we cognize things as existing in space, is taken to be an objective feature of things themselves. The existence of objects in general is thus illegitimately limited to presence in space. Such a “confusion of what belongs to the understanding with what is sensitive” is the metaphysical “fallacy of subreption” (Diss §24, 2:412). Kant presents three illusory principles (i.e. “subreptic axioms”), which make mere sensitive and subjective conditions for judging, objective features of things.⁶⁸

⁶⁸ Diss §24, 2:411-12.

The second subreptic axiom is particularly relevant to the present discussion.⁶⁹ It deals, among other things, with the issues raised in the mathematical antinomies of the *Critique*, namely, the problems of the size of the world and its divisibility. We have seen that in the opening section of the Dissertation, Kant warns against taking the subjective condition of concretely following up concepts in intuition as a condition of possibility of objects themselves. The second subreptic axiom consists in precisely this fallacy. It reaffirms that one can establish that composites consist of simples by means of conceptual considerations. This proposition involves a perfectly cogent logical relation of dependence of the whole on its parts. However, one is seduced to suppose further that this means that it is actually possible to complete the division of wholes into simple parts and to enumerate the stages of this division. In falling prey to the fallacy, one surreptitiously introduces a sensitive element, and thereby the logical relation of dependence is replaced with measurability, which involves a successive procedure in time. Thus, the original, intellectual proposition is mistakenly taken to be equivalent to the proposition that each body consists of a definite number of simples. In order to steer clear of the problems implied in the concept of the world, one must strictly separate the intelligible from the sensible and avoid being misled by the subreptic axioms.

2.4.3 The Dissertation's subreptic axioms and the antinomies

The subreptic axioms and their place in the Dissertation play an important role in Paul Guyer's reconstruction of the history of the antinomy from the Dissertation to the *Critique*. Guyer attempts to explain how and why Kant came to understand the antinomy as a special type of conflict, namely, a conflict whose solution consists in

⁶⁹ See Diss §28, 2:415-16.

transcendental idealism and its distinction between phenomena and noumena.⁷⁰ Guyer begins with Kant's discussion of the subreptic axioms, in which he finds a clear anticipation of the four antinomies of the *Critique*. The first and third axioms correspond to the dynamical antinomies; the second relates to the mathematical antinomies. According to Guyer, the subreptic axioms are "nothing less than principles of epistemological immodesty," since they imply that propositions confirmed by reason can also be confirmed by sensibility.⁷¹ This leads to prejudices. Guyer focuses on those prejudices arising from the second subreptic axiom, which concerns the size and composition of the world. Kant warns against succumbing to the prejudice which leads one to believe that because reason concludes that the size of the world must be limited, one must be able to represent this limit sensorily, and conversely, that our inability to do so challenges the conclusion to which reason leads us. With regard to composition and division, Guyer similarly explains that

although it would be a mistake to infer that because reason tells us that every composition must have simple elements these must be capable of sensory representation, it would be yet another mistake to infer in reverse that because simples are not given in space and time – infinite divisibility being a characteristic of the forms of sensibility – reason must err when *it* tells us that the ultimate constituents of reality are simple.⁷²

This, Guyer concludes, is a purely methodological approach to the antinomies, which merely stresses the difference between reason and sense with regard to epistemological competence. As long as one does not assume that the claims of reason and sense must match, paradoxes are avoided. There is no further suggestion, Guyer

⁷⁰ Guyer, 1987, pp. 385-404.

⁷¹ *Ibid.*, p. 388.

⁷² *Ibid.*, p. 390.

notes, “that the danger of subreptic axioms to prejudices in itself *proves* the split between the sensible and the intelligible worlds. There is no argument that *without* this distinction *paradoxes* ensue.”⁷³ That is, there is no real conflict between two opposing ontological propositions necessitating a distinction between a metaphysical world of noumena and a phenomenal world of physical objects. This split is already assumed when Kant comes to treat the subreptic axioms.

The methodological nature of Kant’s approach is even more evident in notes from later in the 1770s, in which Kant distinguishes between the objective principles of sense and the subjective principles of reason. The former anticipate the antitheses of the antinomies, while the latter anticipate the theses and are merely subjectively necessary as guides for the investigation of the very same phenomenal objects known through sensitive cognition.⁷⁴ The background of the metaphysical dogma of split reality is altogether abandoned. Thus, Guyer argues, “although there may be *tension between two inclinations* within human thought, there is no genuine *conflict between incompatible ontological principles* which could be resolved only by distinguishing between two separate sets of objects or between genuine and merely apparent properties of objects.”⁷⁵

In sum, Guyer distinguishes between Kant’s approach to the antinomy in the Dissertation and in notes from the 1770s on the one hand, and his approach in the *Critique* on the other. The early position shows how to avoid paradoxes by carefully following certain restrictions on the claims of reason and sense. At this stage, the antinomies have a purely methodological character and play no role whatsoever in proving the ontological dogma of split reality. The early approach thus manifests

⁷³ Ibid., p. 390.

⁷⁴ Guyer also points to the practical significance of the principles of reason.

⁷⁵ Ibid.

epistemological modesty, since it avoids ontological commitments concerning the nature of reality. The critical approach to the antinomy, by contrast, is metaphysical and epistemologically immodest, since it construes the antinomy as supporting an ontological distinction between two types of objects. In Guyer's view, nothing justifies this transition.

It is indeed difficult to make sense of a transition from a modest, methodological treatment of the conflicts in the Dissertation to their dogmatic interpretation as proving a metaphysical doctrine of split reality in the *Critique*. This, however, ought to make us doubt such a reading of Kant's development. Contrary to Guyer, I suggest that the transition Kant underwent runs in quite the opposite direction, namely, from a dogmatic treatment of the conflicts in the Dissertation to a critical resolution of the antinomies in the *Critique*. Indeed, I have attempted to show that it is precisely the considerations of the conflicting propositions concerning the size and composition of the world presented in the opening section of the Dissertation that provide the motive to postulate a distinction between the intelligible and sensible worlds. Accordingly, Kant's anticipations of the mathematical antinomies are not to be found in his discussion of the subreptic axioms in the concluding part of the Dissertation, but rather in the initial analysis of the notion of a world in that text.⁷⁶ On this reading, it was Kant's attempt in the Dissertation to resolve the conflicts by means of a metaphysical doctrine of split reality that was dogmatic. Finally, understanding transcendental idealism in light of the two perspective interpretation allows one to read the transition from the Dissertation to the *Critique* as a transition from a dogmatic metaphysics to a critical metaphysics of experience. As we will see in the

⁷⁶ Robert Paul Wolff also finds anticipations of the antinomies in section 1 of the Dissertation. See Wolff, 1963, pp. 12-14.

next chapter, Kant's critical metaphysics of experience strips the principles which fueled the pre-critical versions of the conflicts of their dogmatic metaphysical meaning and reinterprets them as elements of human experience.⁷⁷ In the meantime, let us return to the subreptic axioms and find their proper place in the Dissertation.

The subreptic axioms are not principles of epistemological immodesty, as Guyer interprets them. They urge us neither to seek knowledge of something that is unknowable for us nor to establish a proposition that is undecidable by us. Instead, they push us to acquire knowledge by improper means. As Kant explains, they are illusory principles which mistake subjective conditions of cognition for objective features of things. Again, Kant is especially worried about the damage metaphysical knowledge may suffer if one inappropriately applies principles of sensibility to the cognition of the intelligible world. Such illicit mixtures of epistemic domains result in hybrid propositions (i.e. propositions which ascribe sensitive predicates to intellectual concepts and therefore consider features of phenomenal objects to be applicative to things as they are),⁷⁸ not in conflicts between propositions of reason and propositions of sensibility.

Note again the second subreptic axiom. We have seen that the fallacy in this case consists in taking subjective sensitive conditions of concretely constructing concepts in intuition as conditions of possibility of objects themselves. It pertains to cognitions that have to do with the notions of quantity and quality. The problems concerning the size and composition of the world relate to quantity. Consider the case of the size of the world. Reason shows that the size of the world must be limited. Kant does not contrast this metaphysical proposition with the opposing claim, which supposedly

⁷⁷ See also Grier's (2001, pp. 191-94) criticism of Guyer's reconstruction of the history of the antinomies.

⁷⁸ See Diss §24, 2:412.

comes from sensibility, that the world has no limit. He merely claims that introducing the subjective condition of successively constructing the concept of the magnitude of the world in a finite duration of time generates the proposition that the world has a beginning in time. The latter is a hybrid proposition, since it combines the requirement of reason (that the world must have a limit) and that of sensibility (that it must be possible to represent this limit in space and time). Similarly, adding the subjective conditions of intuitive representation to the metaphysical proposition established by reason that composites consist of simple constituents generates the hybrid proposition that composites consist of a definite number of simple constituents. There is no suggestion of the opposite proposition, namely that composites are infinitely divisible and thus do not consist of simple parts. Furthermore, there is no conflict between the metaphysical propositions of reason and their hybrid counterparts. Kant merely emphasizes that these two set of propositions are not equivalent and that the latter has its origin in sensitive cognition. He even allows that the hybrid propositions too may be true, despite “the blemish of their origin” (Diss §28, 2:416).

In sum, the subreptic axioms do not consist in a set of opposing propositions, as the antinomies in the Dialectic do. They rather serve to warn against combining cognitions from different origins, in accordance with the overall plan of the Dissertation to separate the sensible from the intelligible. Therefore, insofar as the antinomies essentially involve conflicts between opposing propositions, the subreptic axioms are not anticipations of the antinomies, even though they refer to some of the issues discussed in the Antinomy. In particular, there is no conflict with respect to finite and infinite divisibility in the second subreptic axiom.

2.5 Problems with the Dissertation's Solution

Kant writes that the antinomy of pure reason first aroused him from his dogmatic slumber and drove him to the critique of reason, but he does not further elucidate what was wrong with the Dissertation's solution to the conflicts concerning the size and divisibility of the world and what required critical examination. We therefore have to reconstruct the reasons for the transition from the Dissertation's treatment of the conflicts to their critical understanding as antinomies on the basis of what we know about the final analysis in the Antinomy chapter and the scanty evidence in letters and lectures from the 1770s. The first point to note is that in the *Critique*, Kant renounces the separation doctrine, and with it the solution it implied. In the *Critique*, the mathematical antinomies refer to one and the same object, namely, the *physical universe*. It is to this world that the rival approaches refer when they assert the finite or infinite divisibility of the world. We therefore have to find the reasons that led Kant to give up the Dissertation's separation doctrine. A close examination reveals that the doctrine involves serious internal tensions and that it is violated in several places in the Dissertation. The decree to separate the intelligible from the sensible is violated since, on the one hand, sensibility is engaged in intellectual activities, while on the other, the understanding's involvement in the cognition of the phenomenal realm exceeds mere logical employment. First, the sensible faculty is divorced from the understanding only at the cost of granting it some proto-intellectual use that threatens the strict distinction between heterogeneous cognitive faculties and the characterization of sensibility as passive receptivity. Second, the employment of the understanding in the study of the phenomenal world is in fact much more substantive than mere logical ordering of sensitive cognitions. This is in contrast to the official position, according to which the use of the understanding in this study is limited to

logical (and not real) use. Indeed, as Kant admits in his letter to Hertz of February 1772, the Dissertation lacks a critical examination of the application of the understanding to objects. More importantly, a critical examination is required since, as we will see, the fact that the sensible world is not completely divorced from intellectual principles implies that in the Dissertation Kant is still committed to conflicting claims concerning the composition (and size) of the world. I will discuss these two points in the remainder of the chapter.

The Dissertation formally defines sensibility in terms of receptivity or passivity,⁷⁹ yet it also grants sensibility a certain function of coordination and organization. The latter results from (1) the characterization of the form of sensitive representation as an inherent law, according to which sensations (i.e. the matter of sensitive representation) are ordered, rather than being a mere framework within which sensations appear,⁸⁰ and (2) from the relations between the understanding and sensibility. As we have seen, in the Dissertation, Kant restricts the use of the understanding in the phenomenal realm to the logical ordering of the output provided by sensibility. This means that sensibility must contain at least a minimal degree of conceptualization, since bare sensations cannot be ordered and subordinated in hierarchies of genera and species. Indeed, Kant says that the understanding subordinates concepts, cognitions, and appearances, not raw sensations.⁸¹ In

⁷⁹ Sensibility is “the receptivity of a subject in virtue of which it is possible for the subject’s own representative state to be affected in a definite way by the presence of some object” (Diss §3, 2:392).

⁸⁰ The form of a sensitive representation is “a certain law, which is inherent in the mind and by means of which it coordinates for itself that which is sensed from the presence of the object” or “an internal principle in the mind, in virtue of which those various factors [in an object which affect the senses are] clothed with a certain aspect, in accordance with stable and innate laws” (Diss §4, 2:393). See also Diss §15, 2:406 and contrast with Kant’s claim in the Aesthetic that the form of appearance is “that which allows the manifold of appearance to be intuited as ordered in certain relations” and “that within which the sensations can alone be ordered and placed in a certain form” (A20/B34). Robert Paul Wolff also cites Diss §15 as an indication of the active function of sensibility in coordinating sensations (Wolff, 1963, pp. 17-18).

⁸¹ See Diss §5, 2:393-94.

particular, Kant defines “appearance” as “that which precedes the logical use of the understanding” (Diss §5, 2:394) and therefore as the outcome of sensibility. And, as the following passage from the Blomberg Logic indicates, appearance is more than mere sensations.

A representation through the senses is, e.g., a *sensation*. A representation through the understanding is an *appearance*. A representation through reason is a *concept*. The senses sense, the understanding coordinates, but reason subordinates (§249, 24:251).⁸²

The Blomberg Logic is from the years following the publication of the Dissertation. The quoted passage both reinforces the claim that appearances contain some degree of conceptualization and attests to Kant’s growing discomfort with ascribing the functions of coordinating and conceptualizing to sensibility. In this passage, appearance is related to the understanding, and this means that it already contains coordination. Further, in contrast to his claims in the Dissertation, Kant explicitly maintains in this passage that the understanding, rather than the sensibility, coordinates. The higher cognitive faculty, namely reason, subordinates. There are, that is, three elements in cognition: raw, unconnected sensory representations, which belong to sensibility; appearances (i.e. coordinated cognitions), which pertain to the understanding; and subordinated appearances, which refer to reason. In the Dissertation, the intellectual faculty is not yet distinguished into reason and understanding, and it is sensibility itself that provides appearances or coordinated cognitions to the understanding, which subordinates. The application of the

⁸² Unlike the Dissertation, the Blomberg Logic distinguishes two cognitive faculties, namely, understanding and reason. Coordination and subordination are two types of unity of systems (§104, 24:100). In coordination, the elements of the system are “placed next to one another” (§116, 24:108), whereas in subordination, they are placed one under another. Cf. A409/B436.

understanding to these appearances then yields “reflective cognition” or “experience” (Diss §5, 2:394).

The inherent tension in the separation doctrine between allocating the active functions of coordinating and conceptualizing to the sensibility, and insisting that the sensitive intuition “of our mind is always *passive*” (Diss §10, 2:396-97), is all the more evident in Kant’s discussion of the difference between the method of metaphysics and that of the sciences of the sensible world (i.e. mathematics and natural science).

... the *use* of the *understanding* in sciences of this kind, the fundamental concepts and axioms of which are given by sensitive intuition, is only the *logical* use of the understanding. That is to say, it is the use by which we simply subordinate cognitions to one another, according to their universality and in conformity with the principle of contradiction, and by which we subordinate phenomena to more general phenomena, and the corollaries of pure intuition to intuitive axioms (Diss §23, 2:410-11).

The most significant point for our purposes is that the “fundamental concepts and axioms” of the sciences of the phenomenal world “are given by sensitive intuition.” In other words, according to the teachings of the Dissertation, the concepts and laws of mathematics and physics derive from sensibility. To sustain the separation doctrine, it is indeed necessary for the sciences of the sensible world to belong to the sensible faculty. This, however, amounts to intellectualizing the sensible faculty and granting it, as it were, a proto-intellectual use. That is to say, the separation doctrine compels Kant to ascribe functions of coordination and systematization, which are naturally considered intellectual activity, to sensibility. This, however, undermines the characterization of sensibility as receptivity and the classification of the understanding and sensibility as two heterogeneous modes of cognition.

Consider now the function of the understanding. In the Dissertation, Kant appears to advance conflicting claims concerning the employment of the understanding in the “science of sensory things.” Kant’s official position is that in this study, “the use of the understanding is not real but only logical” (Diss §12, 2:398). The logical use of the understanding consists in subordinating cognitions, while its real use consists in generating pure concepts such as possibility, existence, necessity, substance, and cause. Thus, in the Dissertation, Kant officially holds that when studying the phenomenal world, the understanding is merely engaged in systematizing empirical knowledge by subordinating phenomena under general concepts and laws. He rejects the application of the pure concepts of the understanding to phenomena. Nevertheless, the understanding’s involvement in the investigation of the phenomenal world appears to go beyond the logical use. It is evident that pure concepts such as existence, cause, and number are applied in sciences such as physics and mathematics. With respect to the concept of number, Kant in fact admits that “there is a certain concept which in itself, indeed, belongs to the understanding but of which the actualisation in the concrete requires the auxiliary notions of time and space” (Diss §12, 2:397). He also acknowledges a similar application of the concept of cause in experience.⁸³

In section 5, Kant addresses this issue from a different perspective. He distinguishes between the scope of application of sensitive and intellectual predicates. The application of sensitive predicates in a judgment is limited to concepts which are likewise sensitive and represent sensible objects. Sensitive predicates cannot predicate intellectual concepts of things as they are because they contain subjective conditions of human cognition which do not affect the possibility of things themselves. The range of application of intellectual predicates is not similarly limited. For example,

⁸³ See Diss §15, 2:406.

since “existence” is an intellectual concept and “being somewhere” is a sensitive concept, the former can predicate the latter but not the other way around. Thus, we can legitimately assert “whatever is somewhere, exists” but not “whatever exists, is somewhere” (Diss §24, 2:411-12). In other words, intellectual predicates (i.e. concepts of the understanding) represent features that belong to objects in general; they are universally valid and apply to objects of any kind. They therefore also apply to phenomenal objects.

In addition to the fact that the application of intellectual predicates to concepts of phenomenal objects conflicts with Kant’s official position concerning the inapplicability of concepts of the understanding to the phenomenal realm, such a posited application undermines the Dissertation’s solution to the divisibility problem. On the one hand, physical objects, as conditioned by space, are infinitely actually divisible into ever smaller divisible parts. On the other hand, if intellectual predicates are universally valid and can be assigned in a judgment to a subject which is a sensitive concept and represents a phenomenal object, we can say that the predicate “being composed of simple parts” (a feature of objects in general affirmed by the understanding) is also applicable to physical objects in space. This is essentially the move Kant makes in the thesis of the second antinomy. This thesis bypasses the mediation of sensibility and argues directly from intellectual considerations concerning the relation between composites and parts to the conclusion that empirical objects are composed of simple parts. In short, if one allows such a direct application of the understanding to phenomenal objects, the divisibility problem reemerges: phenomenal objects, *qua* conditioned by the subjective forms of sensibility (i.e. space and time), are composed of parts which are always further divisible, and *qua* thought by the understanding, are composed of simple, indivisible parts.

As Kant admits in his letter to Marcus Herz, the Dissertation neglected the analysis of the conditions of intellectual cognition.⁸⁴ As a result the application of the understanding to external objects still stands in need of critical examination.⁸⁵ Various applications of the understanding, which do not cohere with the official position, are found throughout the Dissertation.⁸⁶ Moreover, it seems that such applications are necessary and that the phenomenal world cannot be entirely divorced from the intellectual principles of the intelligible world. The problem, however, is that the application of intellectual principles to the phenomenal world resurrects the very same conflicts which the separation doctrine was supposed to solve. In a word, the

⁸⁴ The absence of critical examination of the conditions of intellectual cognition becomes clearer when contrasted with the Dissertation's treatment of sensitive cognition. In section 3, Kant analyzes the principle of the form of the sensible world, namely, "that which contains the ground of the universal connection of all things, in so far as they are *phenomena*" (Diss §13, 2:398). Kant thoroughly examines the nature of that universal connection and the conditions of the sensitive cognition through which phenomena are known. He shows that space and time are, on the one hand, the universal framework in which empirical objects "are seen as *necessarily* belonging to the same whole," and on the other "the schemata and conditions of everything sensitive in human cognition" (ibid.). Some of the arguments provided here are reiterated almost unchanged in the Aesthetic. In section 4, Kant deals with the principle of the form of the intelligible world and seeks "to explain how it is possible *that a plurality of substances should be in mutual interaction with each other*, and in this way belong to the same whole, which is called a world" (Diss §16, 2:407). Roughly half the length of section 3, section 4 deals almost exclusively with the intelligible world. Kant does not examine here the conditions of intellectual cognition, as he does with respect to sensitive cognition. He simply takes it for granted that the question of the possibility of mutual interaction of substances "can only be solved by the understanding" (ibid.).

⁸⁵ Kant writes in the famous letter to Marcus Herz of February 21, 1772: "I noticed that I still lacked something essential, something that in my long metaphysical studies I, as well as others, had failed to consider and which in fact constitutes the key to the whole secret of metaphysics, hitherto still hidden from itself" (10:130). The key is the question of the ground of the correspondence between intellectual representations and external objects: "In my dissertation I was content to explain the nature of intellectual representations in a merely negative way, namely, to state that they were not modifications of the soul brought about by the object. However, I silently passed over the further question of how a representation that refers to an object without being in any way affected by it can be possible. I had said: The sensuous representations present things as they appear, the intellectual representations present them as they are. But by what means are these things given to us, if not by the way in which they affect us? And if such intellectual representations depend on our inner activity, whence comes the agreement that they are supposed to have with objects – objects that are nevertheless not possibly produced thereby?" (10:130-31).

⁸⁶ In the concluding paragraph of the Dissertation, Kant acknowledges a further application of the intellectual faculty in the study of the phenomenal world. He indicates certain intellectual "principles of harmony" which we must accept as subjective guiding rules for empirical investigations and thus anticipates the regulative function ascribed to reason in the Dialectic. Kant argues that although these rules are subjective and cannot be objectively affirmed with respect to things in the world, we are obliged to use them if we wish to be "successful in the explanation of phenomena." He lists three such rules: everything happens in accordance with the order of nature, principles must not be multiplied beyond necessity, and material things do not come into being or pass away (See Diss §30, 2:418-19).

separation doctrine collapses due to its internal tensions. And yet, the collapse of the separation doctrine regenerates the conflicts concerning the size and composition of the world. Therefore, a new approach to the conflicts involved in the concept of the world is required. It is the task of the Antinomy chapter of the *Critique* to provide such an approach.

Chapter 3: The Second Antinomy

Despite the Dissertation's formal thesis (i.e. that there is a separation between sensible and intelligible objects and correspondingly between the sensible and the intellectual faculties), Kant's subsequent elaboration of the position makes it clear that the sensible, empirical world is not completely divorced from the intelligible world. In light of this, Kant realized that in the Dissertation he was still committed to conflicting claims concerning the size and composition of the empirical world. This led him to engage in a thorough, critical examination of how we consider objects. I suggest that Kant referred to this when he claimed that the antinomy of pure reason had aroused him from his dogmatic slumber and driven him to the critique of reason.

In the *Critique*, Kant realized that a resolution of the conflict between the metaphysical and the mathematical approaches to nature requires a radically new understanding of the empirical world.⁸⁷ His critical examination resulted in a new distinction between two perspectives from which objects can be considered: one which considers the sensible conditions under which objects can be given to us (i.e. as

⁸⁷ It is important to bear in mind that the subject of the antinomy is the *empirical world* of physical objects in space and time and, in particular, that the second antinomy concerns the divisibility of empirical objects. Kant makes this clear when he introduces the problem as one which regards "reality in space, i.e., **matter**" (A413/B440). This does not mean, however, that Kant takes up the standpoint of the mathematical approach. Indeed, matter and space are the basic elements of the conception of reality of the mathematical approach. Yet Kant makes no commitment here regarding the constitution of matter and its relation to space. Matter is to be generically taken as the stuff which makes up the ordinary objects of reality. The nature of the relation between bodies and space is precisely the fundamental question which has to be clarified in the discussion. Therefore, Kant does not assume the side of the mathematical approach all along, and, as we will see, his resolution is not to be identified with the antithesis.

Further, in the opening section of the Antinomy chapter, Kant introduces a distinction between "world" and "nature." The former signifies "the mathematical whole of all appearances" and the latter signifies this same world "insofar as it is considered as a dynamic whole" (A418-19/B446-47). That is, the former refers to the aggregation of all objects, while the latter refers to this aggregation together with the causal connections between the objects. The mathematical antinomies concern only "the mathematical whole of all appearances," and in what follows I refer to it by "world" and "nature" interchangeably.

phenomena), and one which considers objects in abstraction from these conditions, and thus as objects of pure understanding (i.e. as things considered in themselves).⁸⁸ Kant contends that the conflict over divisibility is resolved by distinguishing between phenomena and things in themselves and by taking the empirical world as a phenomenon or an appearance. Due to the nature of the spatial and temporal conditions under which it is given, the empirical world as an appearance cannot be said to have determinate size and composition. From this perspective, then, the debate about the size and composition of the world is misguided. To assign determinate size and composition to the empirical world is a category mistake, since “having determinate size and composition” is a property which pertains to things considered in themselves, but not to the world as an appearance. Thus, on Kant’s account, the conflict is a “dialectical opposition,” not a contradictory one. That is to say, it is not the case that the negation of one proposition entails the affirmation of the other. Rather, both are false since both share an invalid presupposition. Proponents of both positions err in considering the empirical world a thing in itself. This presupposition leads them to believe that the world has determinate size and composition and thus that there is some fact of the matter concerning the size and composition of the world which lie at the heart of the debate and can in principle decide it.

In this chapter, I analyze Kant’s argument in the Antinomy concerning the divisibility and composition of the empirical world. The chapter is divided into three sections. In the first section, I consider the initial step of the argument, namely, Kant’s attempt to provide reasonable and equally compelling proofs for two competing claims: the thesis, that objects are only finitely divisible, and thus that they are ultimately composed of simple, indivisible parts; and the antithesis, that objects are

⁸⁸ See above, note 8.

infinitely divisible and thus do not contain indivisible parts.⁸⁹ In the second section, I examine Kant's resolution of the conflict between these claims. On Kant's analysis, the confusion of phenomenal objects and things in themselves (a mistake which he assigns to transcendental realism), together with the illusion at the basis of the transcendental idea of the world, is what makes the debate intractable. The resolution therefore essentially involves transcendental idealism and the distinction it implies between phenomena and things in themselves. The fact that transcendental idealism turns out to be the key to the resolution of the antinomy constitutes an additional, indirect proof in its support. Finally, the third section concerns the transcendental reconfiguration of the fundamental principles of the rival mathematical and the metaphysical approaches. Rather than taking these principles as referring to objects themselves, Kant reinterprets them in his metaphysics of experience as key elements of human cognition.

3.1 Kant's Proofs of the Thesis and the Antithesis

The first stage of Kant's argument in the second antinomy consists in providing proofs of the two conflicting claims. Surely, if the proofs are supposed to establish a conflict, they have to be reasonable and equally sound. Yet, it is clear that Kant does find a flaw in the proofs he proposes and that they do not represent his considered view. According to Kant, proponents of both views for which he offers proofs err in considering the world a thing in itself. Aside from this error, both proofs are sound. This is what Kant means when he asserts that the proofs are "well grounded, at least

⁸⁹ In what follows I will use "composition of the world" and "composition of objects" interchangeably. Since the world is the sum total of all objects, the parts which make up the objects are in fact the very same parts which constitute the world.

on the presupposition that appearances... are things in themselves” (A507/B535).⁹⁰ My aim in this section is to provide a defensible reconstruction, under this proviso, of the proofs of the thesis and antithesis. As in the pre-critical discussions of the divisibility problem, the proofs essentially involve the basic principles of the rival approaches, that is, the relation between bodies and space and the notion of bodies as composite objects. The two proofs take the form of indirect demonstrations. In each case, the opposite proposition is assumed to be true and then a contradiction is entailed.

The thesis is:

Every composite substance in the world consists of simple parts, and nothing exists anywhere except the simple or what is composed of simples (A434/B462).⁹¹

The proof of the thesis proceeds as follows.

1. Suppose composite substances do not consist of simple parts.
2. If “all composition is removed in thought” there will remain neither composite things (since all composition is removed) nor simple parts (because of 1).
3. Hence nothing at all will remain and “no substance would be given,” which is absurd.

⁹⁰ One should understand Kant’s declaration that he is responsible “for each proof... given of both thesis and antithesis” and that the proofs “establish the certainty of the inevitable antinomy of reason” (P §52b, 4:341) in the same way. This does not mean that he accepts the proofs as flawless, but rather that they are equally sound under the assumption that appearances are things in themselves. For similar claims concerning the soundness of the proofs, see A430/B458; A507/B535; P §52a, 4:340.

⁹¹ Cf. the *Prolegomena* version of the thesis: “Everything in the world is constituted out of the *simple*” (P §51, 4:339).

4. Therefore, either (a) the protasis of 2 is false and it is impossible to remove all composition in thought; or (b) the initial supposition 1 is false, which means that, after the removal of all composition in thought, there remain things which contain no composition, namely, simples.
5. Substances are self-subsisting entities; their joining together is merely a contingent relation and therefore removable.
6. Hence, if 4a is true, then composites are not made up of substances, which contradicts the assumption of composite substances.
7. Therefore, 4b is true and 1 is false: “a substantial composite in the world” consists of simples (A434-36/462-64).⁹²

At first sight, the proof may appear obscure and question begging. It seems that step 6 assumes that “composite substances” (*zusammengesetzte Substanzen*) or “substantial composites” (*substantielle Zusammengesetzte*) must be composed of simple substances, which is just what needs to be proved.⁹³ This impression can be dispelled by correctly interpreting the key notions of “composite substance” and “substance.” The proof does not *presuppose* that composite substances are made up of simple substances. It rather proceeds from the assumption that composite substances are “proper” or “real” *composites*, namely, that there is no logical constraint on separating the parts of composite substances and distancing them from one another. Material bodies are proper composites, since it is possible to conceive of separating their parts and distancing them from one another. The assumption that composite substances are

⁹² Because the second, general part of the thesis (i.e. that “nothing exists anywhere except the simple or what is composed of simples”) “follows immediately” from the proof of the first part, no special argument is provided (A436/B464).

⁹³ Such a worry is raised by Bird, 2006, p. 669.

proper composites is commonly accepted by both sides involved in the debate.⁹⁴ Premise 4a must therefore be false. Consequently, it must be possible to remove all composition in thought because the procedure is applied to proper composites. The objects remaining after the removal of all composition in thought are independent constituents which contain no composition. Premise 5 then identifies them with simple substances. We can thus rephrase step 6 in a way that does not appear question begging: “if 4a is true, then composites are not made up of independent constituents, in contradiction to the assumption of proper composites.” Indeed, the argument hangs on the notion of composite objects, but that by itself does not make it question begging.

As we will see below, the idea of the world is grounded in the hypothetical inference of reason. Consequently, the antinomy involves a series of conditions in which one member depends on its antecedent. In the present case, the parts are the conditions of the composite objects; these parts depend in turn on their parts, and so forth. To assume that there is a definite answer to the problem of divisibility is to assume that the series of the conditions (i.e. the series of parts within parts) is either finite or infinite. Thus, the proof of the thesis of the second antinomy boils down to the claim that when reason thinks of the totality of the conditions of proper composites, it must conclude that the latter are reducible to simples. The requirement

⁹⁴ The second antinomy deals with *actual* divisibility. The entities to which the analysis is applied here are “proper composites.” By this, Kant means things whose parts can be given as separated from one another “at least in thought” (A438/B466). That is, it is logically possible to separate their parts and distance them from one another. Since the parts of a composite can be separated from one another in this way, the composite itself depends on its parts and their joining together. In the terminology used here, the objects under discussion are actually divisible at least metaphysically, if not physically. By contrast, space is not a proper composite. It is only *ideally* divisible and hence can at most be considered an ideal composite. Strictly speaking, however, space is not a *compositum*, but rather a *totum* or whole. That is, its parts are given through it and not the other way around, or, put otherwise, space is not a kind of thing which depends on its parts (see A438-40/B466-68). Hence, the division of space cannot generate a “regressive series of conditions.” This, as we will see below, is a necessary condition for the generation of an antinomy. On the other hand, real objects in space are construed as proper composites or actually divisible things, and therefore satisfy the requirement of the antinomy.

of the totality of conditions and the assumption of proper composites are central to the proof. The former underlies all the antinomies, while the latter is operative in the second antinomy.⁹⁵

This point is made more explicit in the *Metaphysical Foundations of Natural Science*. The argument that Kant assigns to the “dogmatic metaphysician” in this text is that if one demands the totality of conditions of physical objects, one must concede that their division is finite. For, on the one hand, a composite whole, *qua* proper composite, depends on its parts; and, as something containing the totality of its conditions, must contain in advance the entire series of distinct parts on which it depends (“a whole [as a thing in itself] must already contain in advance all of the parts in their entirety, into which it can be divided”). This means that the thought of a composite whole as a mere aggregate of actual, distinct parts is impossible if the entire series of those parts cannot be completely comprehended. On the other hand, such a comprehension is impossible if we take this composite to be infinitely divisible, because an infinite series of parts cannot be thought of as completed (its “concept already implies that it can never be represented as completed, as entirely completed”). And since the comprehension of the complete series of infinitely many parts is impossible, assuming that physical objects contain the totality of their conditions (i.e. their parts), one must conclude that they are finitely divisible into simple parts (MF 4:506).

Premise 5 introduces the conceptual apparatus of the metaphysical approach. According to this approach, substances are the fundamental building blocks of the universe. They are construed as essentially independent entities. That is, they are not necessarily connected to one another, and thus it is logically possible for them to exist

⁹⁵ See also MF 4:506-08.

in isolation. Kant consistently maintains this position beginning in *Living Forces*, and the metaphysician of the Antinomy is no exception.⁹⁶

The antithesis is:

No composite thing in the world consists of simple parts, and nowhere in it does there exist anything simple (A435/B463).⁹⁷

The proof of the antithesis goes as follows.

1. Suppose a composite thing consists of simple parts.
2. Composition is an external relation of substances.
3. Every external relation of substances is possible only in space.
4. Composition of substances is possible only in space (from 2 and 3).
5. A space must contain as many parts as there are in the composite thing occupying it (from 4).
6. Space does not consist of simple parts, but of spaces.
7. Every part of a composite thing occupies a space (from 5 and 6).
8. The absolutely first parts of a composite thing are simple (assumption 1).
9. A simple part of a composite thing occupies space (from 7 and 8).
10. Everything real that occupies a space contains a manifold of constituents which are external to one another, and is therefore a real composite.

⁹⁶ This is in accordance with the Cartesian position that apart from their dependence on God as the source of their existence, substances are essentially independent beings. In *Living Forces* (§7, 1:21-22) Kant first characterizes substances as self-sufficient beings (selbständige Wesen). See also NE 1:413-414 and Diss §17, 2:407.

⁹⁷ Cf. the *Prolegomena* version of the antithesis: “There is nothing simple but everything is *composite*” (P §51, 4:339).

11. A real composite is composed of substances and not of accidents (i.e. of logically independent parts).
12. The simple is composed of substances (from 9, 10, and 11).
13. Step 12 is self-contradictory.
14. Therefore, assumption 1 is false: composite things do not consist of indivisible parts, but of parts within parts to infinity.

Premises 4 and 10 are the key steps of the argument. The former asserts that composite objects are possible only in space and the latter that “everything real that occupies a space contains within itself a manifold of elements external to one another” (A435/B463). Space is the condition of possibility of composites, which implies that composite objects assume the structure of space (premise 5) and are actually divisible into as many parts as there are in the space they occupy.

The second part of the antithesis – “nowhere in [the world] does there exist anything simple” (A435/B463) – is proved by considerations which presuppose transcendental idealism. Kant argues that the objective reality of the simple cannot be established by any possible experience. The simple, therefore, is a mere idea. Here, Kant does indeed vindicate critics who argue that his discussion turns on empirical confirmability and is circular, since it purports to indirectly prove transcendental idealism while assuming the position already established in the earlier parts of the *Critique*.⁹⁸

However unfortunate this line of reasoning may be, it is not required for the proof of the second part of the antithesis.⁹⁹ To begin with, if this proof is supposed to reject

⁹⁸ See the criticisms of Strawson, 1966, p. 175, and Guyer, 1987, p. 410.

⁹⁹ Similar remarks are made by Grier, 2001, pp. 208-09, and Schmiede, 2006, pp. 296-97.

the simple *per se*, then it goes beyond the context of the second antinomy. The second antinomy concerns simples as indivisible constituent parts of composites, not as freestanding entities.¹⁰⁰ Nevertheless, Kant could have appealed to a better line of reasoning even if he had wished to suggest a proof with respect to the simple *per se*. As in the proof of the first part of the antithesis, Kant could simply rely on the fundamental principle of the mathematical approach concerning the essential status of space. For the supporter of the mathematical approach, everything real is in and conditioned by space. Therefore, everything real must assume the structure of space and is consequently infinitely divisible. Thus, the supporter of the mathematical approach in the Antinomy need not assume the results of the Aesthetic even when she tries to complete the proof of the second part of the antithesis.

3.2 Transcendental Idealism and the Resolution of the Antinomy

If Kant's two proofs are successful, a recalcitrant conflict between two opposed propositions ensues. On the common assumption of both sides that the world is a thing in itself, the world has a determinate composition; it either consists of simple

¹⁰⁰ The second antinomy concerns the conditions of "reality in space," namely, conditions of the possibility of objects of external sense. The conditions of the possibility of such physical objects are the parts which compose them. Accordingly, the simple in the second antinomy is the extremity of the regressive series of parts of a composite object, namely, the unconditioned part. Thus, Kant is interested here in simples *qua* constituent parts of composites as in his earlier physical monadology, and not in the simple *per se* as in the Leibnizian monadology, in which the simple is mental substance which stands by itself: "I am talking here only about the simple insofar as it is necessarily given in the composite, so that the latter can be resolved into the former as its constituent parts. The proper signification of the word *monas* (in Leibniz's usage) refers only to the simple given **immediately** as simple substance (e.g., in self-consciousness) and not as element of the composite, which one could better call the atom. And since it is only in regard to composites that I want to prove simple substances, as their elements, I could call the [thesis] of the second antinomy 'transcendental **atomistic**'. But because this word has for some time already been used to indicate a special way of explaining corporeal appearances (*molecularum*), and hence presupposes empirical concepts, it may be called the dialectical principle of **monadology**" (A440-42/B468-77). See also A443/B471. When applied beyond this limited context, the problem of composition and simples discussed in the second antinomy is related in general to entities of any nature and not only to matter in space. In its application to the thinking self or soul, the problem comes to have ethical and religious implications (see A466-68/B494-96).

parts or is composed of an infinite series of divisible parts. In other words, on this assumption there is a fact of the matter which underlies the debate. And since Kant provides equally sound proofs for two opposite propositions on that alleged fact, the conflict appears impossible to resolve. Kant suggests resolving the conflict by denying that the world is a thing in itself and considering it instead an appearance. The world taken in this manner cannot be said to have a determinate composition, which implies that there is no fact of the matter to debate. From this perspective, both opposing propositions are false and the conflict turns out to be a mere “dialectical opposition.”¹⁰¹ Thus, the transcendental idealism which was introduced in the earlier parts of the *Critique* is established in the Antinomy by virtue of the fact that it provides the key to the resolution of the antinomies of reason. Kant argues that this constitutes an indirect proof of transcendental idealism, “if perhaps someone did not have enough in the direct proof in the Transcendental Aesthetic.” He summarizes the indirect proof by means of the conflict concerning the size of the world:

The proof would consist in this dilemma. If the world is a whole existing in itself, then it is either finite or infinite. Now the first as well as the second alternative is false (according to the proof offered above for the antithesis on the one side and the thesis on the other). Thus it is also false that the world (the sum total of all appearances) is a whole existing in itself. From which it follows that appearances in general are nothing outside our representations, which is just what we mean by their transcendental ideality (A506-07/B534-35).

The Antinomy’s indirect proof of transcendental idealism can be summarized as follows:

¹⁰¹ See A504/B532.

1. Assume transcendental realism is true.
2. Then the world, as “a whole existing in itself,” has a determinate size and composition.
3. However, it is possible to establish two opposite and equally compelling propositions concerning its size and composition.
4. This is absurd. Transcendental realism is therefore false.
5. Therefore, transcendental idealism is true and the world is an appearance.

The proofs of the thesis and antithesis are supposed to establish step 3 of the indirect proof of transcendental idealism. The transitions from step 1 to step 2 and from step 4 to step 5 still need to be clarified. This is the task of the following two parts of the present section. I will first clarify why considering the world a thing in itself entails that the world has a determinate composition, and the source of the illusory belief that there is such a fact concerning the determinate composition of the world. Second, I will examine Kant’s claim that the resolution is achieved by considering the world an appearance and by turning the conflict into a dialectical opposition.

3.2.1 The composition of the world as a thing in itself

The first question is why considering the world a thing in itself entails that the world has a determinate composition. And since Kant holds that assuming that the world has a determinate composition (and size) is equivalent to considering it a thing in itself, one can also conversely ask why maintaining that the world has a determinate composition – say, that it is composed of simple parts – means considering it a thing in itself. The answer, in brief, is as follows. Size and composition are special characteristics, since they generate regressive series of conditions. To maintain that the world has a determinate size and composition is to assume that the entire series of

conditions of the world are given. And, in turn, this assumption is equivalent to taking the world to be an object given to a pure understanding, which would supposedly have a privileged, objective view of the world as it is in itself. The answer thus has first to do with the special character of the properties of size and composition of the world as generating series of conditioned items, and second with the problem of the givenness of the entire series of conditions. The first point is connected to the place of the antinomy in Kant's theory of reason, while the second is connected to the doctrine of transcendental illusion¹⁰² and the transcendental distinction between considering the world a thing in itself and considering it an appearance.

Let us begin by explaining why the special character of the property of "being composed of parts" generates a regressive series of conditions. In order to clarify this point, I will briefly examine the place of the antinomy in Kant's theory of reason. The concepts of pure reason (the "transcendental ideas") stem from the "logical use" of reason. Reason in its logical use forms syllogisms (i.e. mediate inferences), by means of which it connects propositions in order to bring unity into the cognitions of the understanding.¹⁰³ Kant maintains that the basic forms of the syllogisms contain the ground of the ideas of reason, just as in the *Analytic* the forms of the logical function of the understanding provides the clue to the discovery of the categories.¹⁰⁴ And since,

¹⁰² In a nutshell, reason's illusion consists in the propensity to regard subjective ideas or maxims for systematic unity of theory as objective principles applicable to entities and to substitute the demand for complete explanation with the postulation of objective "absolute totality" or an "unconditioned." See A297/B353. For a thorough discussion of the transcendental illusion, see Grier, 2001, esp. pp. 117-30; and 2006.

¹⁰³ The logical use of the understanding is that of forming judgments. The understanding generates concepts and formulates judgments or propositions by connecting concepts. Kant remarks that his different characterizations of the understanding (see A67-69/B92-94) are equivalent: "We have above explained the **understanding** in various ways – through a spontaneity of cognition (in contrast to the receptivity of the sensibility), through a faculty for thinking, or a faculty of concepts, or also of judgments – which explanations, if one looks at them properly, come down to the same thing" (A126).

¹⁰⁴ See A321/B377-78, and compare Kant's claim in the *Prolegomena*: "Since I had found the origin of the categories in the four logical functions of all judgments of the understanding, it was completely natural to look for the origin of the ideas in the three functions of syllogisms" (P §43, 4:330).

as the Analytic shows, there are three forms of logical relations (categorical [A is B], hypothetical [if A then B], and disjunctive [either A or B]), there are three types of relations between concepts in syllogisms, and accordingly, three forms of syllogisms. Reason seeks to extend a series of syllogisms of a certain form until the series is complete and nothing is left unexplained or in need of further support. That is, reason seeks to proceed in accordance with the three syllogistic forms “to a subject that is no longer a predicate, ... to a presupposition that presupposes nothing further, [or] ... to an aggregate of members of a division such that nothing further is required for it to complete the division of a concept” (A323/B379-80). The extension of the series of syllogisms gives rise to the ideas of the absolute subject (the soul), absolute totality of conditions of appearances (the world), and absolute totality of all things in general (God *qua* the prototype and source of possibility of all things).

The idea of the world (the subject of the Antinomy chapter) is divided into four particular cosmological ideas, in accordance with the four sets of categories.¹⁰⁵ Since the idea of the world is grounded in the hypothetical syllogism, and consequently involves dependence relations, “not all categories will work here, but only those in which the synthesis constitutes a **series**, and indeed a series of conditions subordinated (not coordinated) one to another for any conditioned” (A409/B436). In other words, the sequence of syllogisms in the case of the idea of the world has to yield a series in which one member depends on its antecedent. The categories of

¹⁰⁵ In the Antinomy, Kant explains that reason does not generate original, pure concepts of itself, as the understanding does. Rather, it only releases the concepts of the understanding from the limitation of the understanding to possible experience. Reason seeks the absolute totality of a series of conditions for a certain conditioned thing which is thought through the categories in accordance with the principle that “if the conditioned is given, then the whole sum of conditions, and hence the absolutely unconditioned, is also given, through which alone the conditioned was possible.” So conceived, transcendental ideas are “nothing except categories extended to the unconditioned” (A409/B436). Hence, they draw their systematic organization from the structure of the table of the categories. There are, therefore, four cosmological ideas corresponding to the four headings of the categories: quantity, quality, relation, and modality.

quality and reality generate a regressive series of parts within parts, in which each member of the series depends on its parts.

... reality in space, i.e., **matter**, is likewise something conditioned, whose inner conditions are its parts, and the parts of those parts are the remote conditions, so that there occurs here a regressive synthesis, whose absolute totality reason demands; and that cannot occur otherwise than through a complete division, in which the reality of matter disappears either into nothing or else into that which is no longer matter, namely the simple. Consequently here too there is a series of conditions and a progress toward the unconditioned (A413/B440).

In short, the property of “being composed of parts” generates a series of conditions in which each member depends on its antecedent. To assume that the world has a determinate composition is to assume that the series of parts which compose objects in the world are either finite or infinite. In the technical terms of the *Critique*, this means that the entire series of conditions of a material object – either the finite series of parts which ends with indivisible constituents or the infinite series of parts within parts – is given with the object, namely, “contained in the object and its connection” (A308/B364). Simply put, to assume that the world has a determinate composition is to think that objects in the world already contain the distinct parts from which they are composed, or equivalently, that the parts of an object are already differentiated as its distinct constituents.

Kant claims that considering the empirical world a thing in itself is equivalent to assuming that the entire series of conditions of (the objects that make up) the world is given for the following reason. He maintains that in the case of things in themselves, if a conditioned object is given, then the entire series of its conditions is given together with it. (As we will see in the next subsection, this is not true in the case of appearances). This is so because considering objects things in themselves means

taking them to be “objects given to the mere understanding” (A500/B528).¹⁰⁶ An understanding which needs no sensible faculty in order to have access to its objects, and is therefore unrestricted by something like our subjective limitations of sensibility, knows its objects “as they are in themselves,” including all the conditions which make them possible. From the point of view of such putative pure understanding, objects are known together with the entire set of the atemporal conditions which they presuppose. As Kant explains, “this is nothing but the logical requirement of assuming complete premises for a given conclusion, and no time-order is present in the connection of the conditioned with its condition” (ibid.).

If the conditioned as well as its condition are things in themselves, then when the first is given not only is the regress to the second **given as a problem**, but the latter is thereby really already **given** along with it; and, because this holds for all members of the series, then the complete series of conditions, and hence the unconditioned is thereby simultaneously given, or rather it is presupposed by the fact that the conditioned, which is possible only through that series, is given. Here the synthesis of the conditioned with its conditions is *a synthesis of the mere understanding, which represents things as they are* without paying attention to whether and how we might achieve acquaintance with them (A498/B526-27, italics added).

The source of the belief that if a conditioned is given, then the entire series of its conditions is given together with it, lies in a natural illusion of reason. The doctrine of transcendental illusion maintains that we naturally and unavoidably slide from the legitimate subjective, logical maxim of reason “to find the unconditioned for conditioned cognitions of the understanding, with which its unity will be completed,” to the metaphysical principle that “when the conditioned is given, then so is the whole series of conditions subordinated one to another, which is itself unconditioned, also

¹⁰⁶ See above, note 8.

given” (A307-08/B364).¹⁰⁷ This metaphysical principle is the major premise of the dialectical syllogism which underlies the antinomy:

1. If the conditioned is given, then the entire series of all conditions for it is also given.
2. Objects of the senses are given as conditioned.
3. Therefore, the entire series of all conditions of sensible objects is also given.¹⁰⁸

This syllogism poses a problem for transcendental realism. The transcendental realist, who fails to distinguish appearances from things in themselves and who views the empirical world as a thing in itself, lacks the required conceptual apparatus to notice the different meanings of “conditioned” in the two premises of the syllogism, and is consequently committed to the conclusion that the entire series of conditions of the empirical world is given. In the minor premise, the conditioned is an empirical concept of the understanding which refers to appearances, namely, things considered in relation to the sensible conditions under which objects are given to us in intuition. In the major premise, the conditioned is a pure concept referring to things considered in themselves, independently of our sensibility. That is, it signifies intelligible things as they are known by some pure intelligence unrestricted by sensibility.¹⁰⁹

¹⁰⁷ See Grier, 2001, pp. 117-30.

¹⁰⁸ Along these lines, Kant claims that “The entire antinomy of pure reason rests on this dialectical argument: If the conditioned is given, then the whole series of all conditions for it is also given; now objects of the senses are given as conditioned; consequently, etc. Through this syllogism, whose major premise seems so natural and evident, a corresponding number of cosmological ideas are introduced, in accordance with the difference of the conditions (in the synthesis of appearances), insofar as they constitute a series, which postulate an absolute totality of these series and thereby put reason into an unavoidable conflict with itself” (A497/B525-26).

¹⁰⁹ We should note briefly that particular ambiguities detected by commentators in key notions in the proofs of the second antinomy (such as simple, substance, and composition) should be traced to the

The deception of the dialectical syllogism is “not artificial, but an entirely natural mistake of common reason” (A500/B528). This mistake turns on two natural tendencies which stem from the peculiarity of our reason. First, as we have seen, it is natural to transform the subjective logical precept to find the unconditioned for any given conditioned object into a metaphysical proposition which asserts that when a conditioned object is given, the entire series of its conditions is also given. Second, it is natural to take, as the transcendental realist does, the “objects of the senses” in the minor premise as things in themselves, and so to assume completeness of conditions in their case as well.

... it is likewise natural (in the minor premise) to regard appearances as things in themselves and likewise *as objects given to the mere understanding*, as was the case in the major premise, where I abstracted from all conditions of intuition under which alone objects can be given. But now in this we have overlooked a remarkable difference between the concepts. The synthesis of the conditioned with its condition and the whole series of the latter (in the major premise) carries with it no limitation through time and no concept of succession. The empirical synthesis, on the contrary, and the series of conditions in appearance (which are subsumed in the minor premise), is necessarily given successively and is given only in time, one member after another; consequently here I could not presuppose the absolute **totality** of synthesis and the series represented by it, as I could in the previous case, because there all members of the series are

above-mentioned general ambiguity (For discussions of such ambiguities, see Grier, 2001, pp. 200-01, 207; and Schmiede, 2006, pp. 290-91). Simple may mean logically independent, but it may also be taken in the context of part and whole relation. Similarly, in considering composition as an external relation, one may emphasize its being a *relation* and therefore something which is not logically necessary, or its being *external* and therefore conditioned by space. These specific ambiguities are consequences of the general ambiguity which Kant exposes in the dialectical syllogism. Because one applies the pure concept of intelligible composite made up of self-sufficient simple substances to empirical objects in space, one takes material substance both as a logical individual and as a part of an empirical object. The same is true of composition. If it is taken with regard to intelligible entities, composition is construed as a mere relation of self-sufficient substances, whereas if it is applied to sensible objects, it is understood as external, since it is conditioned by space. Kant is therefore not to be criticized for the fact that the proofs he provides on behalf of the metaphysician and the mathematician contain ambiguities. On the contrary, his critical investigation is the key to exposing these ambiguities and to avoiding the deception of the dialectical arguments in which they figure.

given in themselves (without time-condition), but here they are possible only through the successive regress, which is given only through one's actually completing it (A500-01/B528-29, italics added).

In sum, assuming that the world has a determinate composition is equivalent to considering it a thing in itself, since to maintain that the world has a determinate composition is to assume that the entire series of conditions of the world are given; and this assumption is equivalent to taking the world as an object which is given to a pure understanding, namely, a thing in itself. Driven by reason's inherent demand for finality, one naturally ignores the spatiotemporal limitations of appearances and takes them as objects of "mere understanding" to which completeness of conditions can be assigned. To notice the illusion and avoid its deception, it is necessary to reveal the ambiguity in the dialectical syllogism by drawing a distinction between appearances and things in themselves. This, however, is not an option for the transcendental realist, who, by definition, confuses appearances and things in themselves. The transcendental realist therefore falls prey to the illusion and is committed to the conclusion of the syllogism. That is, she concludes that the entire series of conditions of the empirical world is given, or equivalently, that it has a determinate composition (and size). Consequently, she is forced to choose between two incompatible but equally sound propositions concerning the composition of the world.

3.2.2 The conflict as a dialectical opposition

The last stage of the Antinomy's indirect proof of transcendental idealism also requires clarification. This stage consists in the transition from rejecting transcendental realism to affirming transcendental idealism. If transcendental realism and transcendental idealism are understood as mutually exclusive general

philosophical positions, the negation of the former immediately entails the affirmation of the later. Yet, we still must explain why considering the world an appearance enables one to avoid the puzzle which besets the transcendental realist. That is, we must explain why the transcendental idealist is not forced to choose between equally sound but opposite propositions. In brief, Kant's answer is that since, as he established in the Aesthetic, the world *qua* appearance is given in space and time, and since space and time are indefinitely given magnitudes, the world as an appearance has no determinate size and composition. Thus, questions as to whether the world is finite or infinite and whether the series of parts composing it are finite or infinite are inapplicable, and the debate about them is misguided. On Kant's account, the debate is a "dialectical opposition," not a contradictory or an "analytical" one. By this he means that the negation of one side does not entail the affirmation of the other. Instead, both views are false, since both presuppose an invalid condition. The thesis and the antithesis are contraries and not contradictories, which means that both may be false and are in fact false, since both mistakenly take the spatiotemporal world as a thing in itself. This presupposition leads to the assumption that the world has determinate size and composition.

Kant illustrates his point in two passages that I will quote in full, since they are crucial to proper understanding of his resolution of the antinomy.

If someone said that every body either smells good or smells not good, then there is a third possibility, namely that a body has no smell (aroma) at all, and thus both conflicting propositions can be false. If I say the body is either good-smelling or not good-smelling (*vel suaveolens vel non suaveolens*), then both judgments are contradictorily opposed, and only the first is false, but its contradictory opposite, namely that some bodies are not good-smelling, includes also those bodies that **have no smell at all**. In the previous opposition (*per disparata*) the contingent condition of the concept of body (of smell) **remained** in the case of the

conflicting judgment, and hence it was not ruled out by it; hence the latter judgment was not the contradictory opposite of the former.

Accordingly, if I say that as regards space either the world is infinite or it is not infinite (*non est infinitus*), then if the first proposition is false, its contradictory opposite, “the world is not infinite,” must be true. Through it I would rule out only an infinite world, without positing another one, namely a finite one. But if it is said that the world is either infinite or finite (not-infinite), then both propositions could be false. For then I regard the world as determined in itself regarding its magnitude, since in the opposition I not only rule out its infinitude, and with it, the whole separate existence of the world, but I also add a determination of the world, as a thing active in itself, which might likewise be false, if, namely, the world were **not given at all as a thing in itself**, and hence, as regards its magnitude, neither as infinite nor as finite. Permit me to call such an opposition a **dialectical** opposition, but the contradictory one an analytical **opposition**. Thus two judgments dialectically opposed to one another could both be false, because one does not merely contradict the other, but says something more than is required for a contradiction (A503-04/B531-32).

The assertions “x smells good” and “x smells not good” are both false if x has no smell at all. Both propositions presuppose the invalid condition that x has a smell, and thus neglect the possibility that x may have no smell whatsoever. Similarly, in the case of composition both opposite propositions are false since they mistakenly presuppose that the world is a thing in itself and thus that it has a determinate composition. The question “does x smell good or not good?” in the former case and the question “is the series of parts composing the world finite or infinite?” in the latter case are both inapplicable, since the relevant objects do not have the required properties (smell, determinate composition). In the case of the second antinomy, assigning determinate composition to the empirical world is a category mistake, since “having a determinate composition” is a property which pertains, as we have seen, to things considered in themselves, but not to things taken as appearances, that is to say,

to things considered with respect to the subjective spatial and temporal conditions under which they are given. A determinate composition cannot be a property of the empirical world, or equivalently, the complete series of the parts which make up the physical world cannot be completely given, due to the nature of these conditions.

Space and time, as infinite magnitudes, are not given to us as objects. Every physical object is located in a certain spatial region. The particular region in which it is given is a part of a larger region, and that larger region is a part of yet further larger region, and so on. In following this procedure, one gradually broadens one's view, but one never arrives at an all-encompassing view of the entire, infinite space which contains everything. Accordingly, physical things in space, along with their complex relationships of dependencies, are revealed gradually in the empirical investigation, and are therefore never completely given. This consideration concerning the infinitely large also applies to the infinitely small. From a particular, given spatial region, one gradually arrives at smaller and smaller regions by means of division, but one never arrives at a final view of the infinitely small. Accordingly, the division of a physical object as "as a mere filling of space" (A526/B554)¹¹⁰ extends gradually and indefinitely, never coming to an ultimate point from which it can be deduced that the series of parts is finite and infinite. This is why Kant claims that "the multiplicity of parts in a given appearance is in itself neither finite nor infinite, because appearance is nothing existing in itself, and the parts are given for the very first time through the regress of the decomposing synthesis, and in this regress, which is never given absolutely **wholly** either as finite nor as infinite" (A505/B533).

¹¹⁰ I will elaborate on the importance of the "given in space" qualification in the concluding part of the present chapter.

Kant's claim in the "Metaphysical Exposition" of space in the *Transcendental Aesthetic* that space is represented as "an infinite **given** magnitude" (A25/B39) seems to conflict with the argument of the previous paragraph. But the parallel considerations with regard to time makes it clear that Kant does not mean that infinite space and time are simply given to us or can be objects for us. He explains that "[d]ifferent times are only parts of one and the same time" and that "[t]he infinitude of time signifies nothing more than that every determinate magnitude of time is only possible through limitations of a single time grounding it." Hence, Kant concludes, the representation of time "must... be given as *unlimited*" (A31-32/B47-48, italics added). Correspondingly, on Kant's account of space every physical object is located in and occupies a determinate region of space, and every determinate region of space presupposes the single, all-encompassing space which grounds it. Hence, space is present or "given" in every experience of physical objects. Specifically, space is *given as infinite* in the sense that every determinate space presupposes the single, all-encompassing space and can always be seen as a part of larger and larger spaces in an *unlimited* fashion. Although the infinite, all-encompassing space is presupposed in every experience of physical objects and in every determination of a certain magnitude of space, the progress to ever larger spaces is limitless and never arrives at the infinite space. This account is thus in line with Kant's characterization of the all-encompassing space as a "necessary concept of reason" or a "mere *idea*" in the *Metaphysical Foundations of Natural Science* in the context of the problem of the determination of motion.¹¹¹

¹¹¹ See: "[Absolute space] cannot be an object of experience, for space without matter is no object of perception, and yet it is a **necessary concept of reason**, and thus nothing more than a **mere idea**. For in order that motion may be given, even merely as appearance, an empirical representation of space is required, with respect to which the movable is to change its relation; but the space that is to be perceived must be material, and thus itself movable, in accordance with the concept of a matter in

In short, transcendental idealism enables one to avoid the puzzle which besets transcendental realism and thus qualifies as the key to the resolution of the antinomy. On the transcendental idealist's view, the world cannot be said to have a determinate composition, or equivalently, it is a category mistake to assign determinate composition to the world. Thus, the conflict concerning the composition of the world is transformed into a mere "dialectical opposition," and the question at the heart of the debate – is the series of parts finite or infinite? – turns out to be inapplicable. As a result, the transcendental idealist is not forced to choose between equally established but opposite propositions concerning the composition of the world. It is important to note that it is not that there is some hidden fact concerning the composition of the world which we simply cannot reveal. It is rather that the assumption itself that the world has a determinate composition is misguided since the world, *qua* appearance, has no such composition.

This is the gist of Kant's new approach to the problem of the divisibility and composition of the world in the Antinomy. It has not always been sufficiently appreciated in the literature. Some commentators, both critical and sympathetic, tend to read Kant's discussion as concerning provability or the empirical inability to decide the issue rather than the inappropriateness of the debate due to its dialectical character. Others acknowledge Kant's claim that the debate is ill-founded, since there is no fact of the matter concerning the composition of the world, but reject it.¹¹² On

general. Now, to think of it as moved, one may think it only as contained in a space of greater extent, and take the latter to be at rest. But the same can be done with the latter, with respect to a still further extended space, and so on to infinity, without ever arriving by experience at an immovable (immaterial) space, with respect to which either motion or rest might absolutely be attributed to any matter. Rather, the concept of these relational determinations will have to be continually revised, according to the way that we will consider the movable in relation to one or another of these spaces" (MF 4:559, boldface added). See also MF 4:481-82, 4:560.

¹¹² Guyer understands the antinomical conflicts as concerning our inability to decide certain cosmological questions and thus rejects Kant's recourse to transcendental idealism in order to resolve them (Guyer, 1987, pp. 385-415; 2006, p. 144). Bird also interprets the conflict as one which turns on

the former reading, the conflict concerning the composition of the world turns on the mere fact that we cannot verify or confirm either of the answers suggested. Supporters of this reading object that we may grant the transcendental realist's conclusion that there is a fact concerning the composition of the world and at the same time simply resist the need to choose between equally sound propositions on account of our inability to decide the issue. We may claim that objects consist either of indivisible parts or of parts within parts to infinity, but concede that we cannot confirm either view. Kant would respond that this understanding may perhaps explain why we cannot answer the question concerning the composition of the world, but it does not explain why we are driven into an antinomy, namely, why we are led to choose between opposite yet equally established propositions concerning the composition of the world. This understanding of the conflict ignores the illusion concealed in the idea of the world. For Kant, the crux of the conflict concerns the special nature and coherence of the idea itself and not decidability or verifiability.

Kant challenges the coherence of the idea of the world.¹¹³ If the idea of the world were an empirical concept of an object, determining it one way or another would be a

decidability or verifiability (Bird, 2006, pp. 673-85). He stresses, however, that "Undecidability here does not mean merely a lack of conclusive evidence but a lack of *any* evidence in principle either in favor of or against thesis or antithesis" (ibid., p. 680). Allen Wood grants that for Kant the gist of the problem is the lack of fact of the matter but challenges his argument in support of this position (Wood, 2010, pp. 258-61. I discuss Wood's objection in chapter 5). For readings which emphasize Kant's analysis of the debate as a dialectical opposition, see Posy, 1983; Gardner, 1999, pp. 249-55; and Allison, 2008, pp. 275-77.

¹¹³ A comparison with Leibniz may be instructive here. In "Meditations on Knowledge, Truth, and Ideas" Leibniz argues that the fact that one actually entertains a concept of something does not entail that one has a coherent concept or an idea of that thing: "we do not always at once have an idea of a thing of which we are conscious of thinking" ("Meditations," L 293). One must first demonstrate that such a concept is coherent and possible. We can know the possibility of a concept either *a posteriori* by experiencing a corresponding object or *a priori* by analyzing the concept into its constituents and showing that their combination does not involve a contradiction. Leibniz gives the example of the concept of most rapid motion. We actually entertain this concept in thought and believe that we thereby coherently think. Yet it can be shown, by means of a thought experiment, that the notion of most rapid speed involves an absurdity. Thus, despite the initial impression, we have no coherent concept or an idea of most rapid motion. Leibniz accordingly criticizes Descartes's argument for the existence of God which takes off from the concept of a most perfect being without first demonstrating its possibility.

matter to be settled *a posteriori*. If that were the case, one could appeal to one's cognitive inability to decide the issue, since, as Kant admits, one cannot hope to decide all empirical matters with certainty.¹¹⁴ Kant argues, however, that the idea of the world is not empirically given.¹¹⁵ It involves questions concerning the general features of possible experience and their root in our reason, rather than concrete properties of an actual object. Therefore, determining it is a matter for transcendental reflection, rather than empirical investigation.¹¹⁶ More specifically, transcendental reflection reveals that the idea of the world originates from the incompatible requirements of the understanding and reason.

Such a dialectical doctrine will relate not to the unity of understanding in concepts of experience, but to the unity of reason in mere ideas, whose conditions, since, as a synthesis according to rules, must first be congruent with the understanding, and yet at the same time, as the absolute unity of this synthesis, must be congruent with reason, will be too large for the understanding if this unity is to be adequate to the unity of reason, and yet too small for reason if they are suited to the understanding; from this there must arise a contradiction that cannot be avoided no matter how one may try (A422/B450).¹¹⁷

¹¹⁴ On this issue, Kant states that “in natural science there are an infinity of conjectures in regard to which certainty can never be expected, because natural appearances are objects that are given to us independently of our concepts, to which, therefore, the key lies not in us and in our pure thinking, but outside us, and for this reason in many cases it is not found; hence no certain account of these matters can be expected” (A480-81/B508-09).

¹¹⁵ I discuss the meaning of “givenness” in chapter 5 below, in the context of Wood’s objection to Kant’s argument. In general, “empirically given” does not merely signify “direct experience” of an object, but rather more broadly something connected by (empirical or transcendental) laws of experience to some intuition.

¹¹⁶ See Kant’s discussion in section 4 of the Antinomy chapter, entitled “The transcendental problems of pure reason, insofar as they absolutely must be capable of a solution” (A476-84/ B504-12).

¹¹⁷ Kant elaborates this point in section 5 of the Antinomy chapter, entitled “Skeptical representation of the cosmological questions raised by all four transcendental ideas” (A485-90/B513-18). See also A529/B557. For a clear exposition of this point, see Gardner, 1999, pp. 246-47

The unity of the understanding is “the unity of a possible experience” (A307/B363) or a unity “in which alone [things] can belong to one experience” (A228/B281).¹¹⁸ It refers, in other words, to the unification of objects in a single spatiotemporal framework in accordance with the categories and the principles of the understanding. The unity of reason, by contrast, does not deal with objects but rather with the understanding’s cognitions of objects. Its function is to bring “systematic unity” into the manifold cognitions of the understanding and to integrate them into “an absolute whole” in accordance with the ideas of reason.¹¹⁹ In short, the understanding is engaged in a series of cognitions of conditioned objects within the confines of possible experience, while reason aims to unify these cognitions into a totality by tracing the complete series of their conditions, namely, their unconditioned ground.

The notion of the world results from the application of both the unity of the understanding and the unity of reason. On the one hand, as the concept of the sensible world, the notion of the world implies the collection of all empirical objects. And as a concept of a supposedly empirical object, it must conform to the limitation of the understanding to possible experience. On the other hand, it involves the notion of the totality of conditions of empirical objects. As such, the notion of the world is the idea

¹¹⁸ I prefer Kemp Smith’s rendering of “zu einer Erfahrung gehören” as “belong to *one* experience” over Guyer and Wood’s rendering “belong to *an* experience.” The former emphasizes the role of *unity* in the expression “unity of understanding.”

¹¹⁹ See: “Thus reason relates itself only to the use of the understanding, not indeed insofar as the latter contains the ground of possible experience (for the absolute totality of conditions is not a concept that is usable in an experience, because no experience is unconditioned), but rather in order to prescribe the direction toward a certain unity of which the understanding has no concept, proceeding to comprehend all the actions of the understanding in respect of every object into an **absolute whole**” (A326-27/B383); “If we survey the cognitions of our understanding in their entire range, then we find that what reason quite uniquely prescribes and seeks to bring about concerning it is the **systematic** in cognition, i.e., its interconnection based on one principle. This unity of reason always presupposes an idea, namely that of the form of a whole of cognition, which precedes the determinate cognition of the parts and contains the conditions for determining *a priori* the place of each part and its relation to the others. Accordingly, this idea postulates complete unity of the understanding’s cognition, through which this cognition comes to be not merely a contingent aggregate but a system interconnected in accordance with necessary laws. One cannot properly say that this idea is the concept of an object, but only that of the thoroughgoing unity of these concepts, insofar as the idea serves the understanding as a rule” (A645/B673). See also A302/B359, A323/B380, A648/B676.

of the unconditioned totality of appearances, and thus transgresses the limitation of the understanding.¹²⁰ The result is that the idea of the world, if taken as referring to an object, involves a contradiction.

The contradictory standards of the understanding and reason implied in the idea of the world generate a two-sided illusion, namely, an illusion which consists of two equally valid but contradictory conceptions of the unconditioned.¹²¹ The unconditioned can be taken either, in line with the standard of the understanding, as the entire infinite series of conditioned members or, in keeping with the demands of reason, as the first member of the series. The former is “too small” for reason, the latter “too large” for the understanding. In our case, the unconditioned can be taken either as the entire infinite series of parts within parts or as the simple constituents (the unconditioned parts) of the composite object.¹²² The former option is too weak to satisfy reason, while the latter is too strong for the understanding, since it transgresses the limits of possible experience.

We therefore think incoherently when “we stubbornly insist on an actual object corresponding to [the idea of the world]” (A482/B510). It is tempting to believe that the coherence of the idea is determined *a posteriori* and that the idea signifies an ordinary object, since we are dealing here with the empirical, sensible world, and not with transcendent entities, as in the case of the ideas of the soul and God. But this is a false belief, since we experience phenomena *in the world*, but never *the entire world* of phenomena. The idea of the world is only pseudo-empirical.¹²³ It has its origin in

¹²⁰ See A407-08/B434-35, A419-20/B447-48, A478-79/B506-07; P §50, 4:338.

¹²¹ See A406-07/B433-34, A420-21/B448-49.

¹²² In the case of the idea of the temporal magnitude of the world (discussed in the first antinomy) it can be concluded either that the series of past times leading to the present has no first member and thus extends infinitely, or that it has a first member and thus the world has a beginning in time.

¹²³ The term is suggested in Allison, 1983, p. 57; 2004, p. 360. As Graham Bird puts it, we inadvertently move here from ordinary empirical investigation to problematic metaphysical

an intellectual illusion, not in experience. Consequently, however one determines its object, either as suggested in the thesis (i.e. as composed of simple, indivisible parts) or as suggested in the antithesis (i.e. as composed of infinite series of parts within parts), “the result in both cases [is] something quite empty of sense (nonsense)” (A485/B513).

In conclusion, Kant’s resolution of the antinomy consists in providing the means for revealing the natural illusion involved in the idea of the world and for avoiding its deception. Specifically, the means Kant provides is the transcendental distinction between appearances and things in themselves. If appearances are taken as things in themselves (i.e. as objects of pure understanding, the conditions of which are completely given), one will have to conclude that the entire series of conditions of sensible objects is given, and thus that the world has a determinate composition. And since both opposite propositions concerning that composition are established with equally valid proofs, one is forced to decide between equally sound but opposite options. Transcendental idealism is the key to the resolution of the antinomy because its insistence that appearances are not things in themselves relieves one of the dilemma. If the composite object is not a thing in itself, its division is not determined in advance, which means that one does not have to decide between the opposite options.¹²⁴ Kant lucidly summarizes the point in the following passage.

Here is now the strangest phenomenon of human reason, no other example of which can be pointed to in any of its other uses. If (as normally happens) we think of the appearances of the sensible world as things in themselves, if we take the principles of their connection to be

speculation: “The transition can be understood as one which moves from unproblematic enquiries within natural science to related, more general but highly problematic, issues in metaphysics” (Bird, 2006, p. 673).

¹²⁴ Another way of putting it is that Kant’s transcendental inquiry exposes the illusion and relieves us of its grip. This therapeutic function of Kant’s discussion in the Dialectic and in the Antinomy in particular is emphasized by Bird, 2006, pp. 589-91, 609-23, 661-62, 727-37; and Allison, 2008, pp. 275-82.

principles that are universally valid for things in themselves and not merely for experience (as is just as common, nay, is unavoidable without our *Critique*): then an unexpected conflict comes to light, which can never be settled in the usual dogmatic manner, since both thesis and antithesis can be established through equally evident, clear, and incontestable proofs – for I will vouch for the correctness of all these proofs – and therefore reason is seen to be divided against itself, a situation that makes the skeptic rejoice, but must make the critical philosopher pensive and uneasy (P §52b, 4:339-40).

3.3 Reinterpreting the Principles of the Competing Approaches

Kant's analysis of the conflict concerning the composition of the world shows that both sides of the conflict assume that the world is a thing in itself, and therefore that it has a determinate composition. Kant resolves the conflict by dismissing that assumption and contending instead that both opposite propositions are false. Notwithstanding this, Kant does not completely reject the key metaphysical principles by which the adversaries attempt to determine the composition of the world. We have seen that in determining the series of parts of a composite object, the supporter of the mathematical approach focuses on space as the condition of external objects, while the adherent of the metaphysical approach concentrates on the requirement that composites be grounded in simples. Instead of taking these simply as ontological principles which apply to objects themselves, Kant examines them from a transcendental point of view and reinterprets them as essential factors of human cognition. The fact that the same central notions and principles of the traditional view of the divisibility conflict which pervade the pre-critical writings still play an important role in the *Critique* may seem to accord with Gerd Buchdahl's claim that, in Kant, "[m]ore often than not traditional attitudes are merely integrated within new vistas; and the latter may even be subtly modified to accord with the earlier and the older framework." According to Buchdahl, the extent of the changes in Kant's

thought from the pre-critical to the critical period has been exaggerated.¹²⁵ This might mean that despite the new vistas, Kant still operates in the Antinomy and, more generally, in the *Critique*, within the metaphysical tradition of his predecessors in trying to settle ontological issues by means of established principles.¹²⁶ I suggest however, in line with Graham Bird's reading, that the new vistas of the Antinomy rather signify a radical break from that tradition. According to Bird, Kant's idealism must be distinguished from traditional forms of idealism, and his (Kant's) project has to be understood as a metaphysics of experience in which the fundamental elements of human cognition are analyzed and placed in their proper locations in the map of human knowledge.¹²⁷ In the context of the Antinomy, this involves a shift from an ontological explication of the question concerning the composition of the world to a transcendental analysis of the principles on which the opponents in the dispute base their claims.¹²⁸ In the present section, I wish to demonstrate Kant's reinterpretation of the metaphysical principles as basic elements of human cognition.

Let us begin with the mathematical approach and the status of space. According to the adherent of the mathematical approach, space is an entity which modifies things themselves. That is to say, space, as an independent entity or a container in which material objects exist, is an ontological condition for the existence and structure of material objects. The adherent of the mathematical approach therefore concludes that the infinitely divisible space entails the infinite divisibility of the objects extending in it. This is precisely Kant's view of space in *Directions in Space*.

¹²⁵ Buchdahl, 1969, p. 471, and see also pp. 552, 556-57, 680.

¹²⁶ At some point, however, Buchdahl remarks that the pre-critical writings "are actually seldom as 'uncritical' as they may appear to the reader at first sight" (ibid., p. 478, note 1). This can be taken to imply that it is not only that the later, critical Kant was revolutionary, but that he had been so all along.

¹²⁷ Bird, 2006, p. 10.

¹²⁸ Thus the strategy of the Antinomy, and the Dialectic as a whole, is consistent with the general line of argument of the Analytic which is encapsulated in the claim that "the proud name of an ontology, which presumes to offer synthetic *a priori* cognitions of things in general in a systematic doctrine... must give way to the modest one of a mere analytic of the pure understanding" (A247/B303).

My purpose in this treatise is to see whether there is not to be found in the intuitive judgements about extension such as are to be found in geometry, clear proof that: *Absolute space, independently of the existence of all matter and as itself the ultimate foundation of the possibility of the compound character of matter, has a reality of its own...* The proof, which I am seeking here, is intended to furnish, not engineers, as was *Euler's* purpose, but geometers themselves with a convincing argument which they could use to maintain, with the certainty to which they are accustomed, the actuality of their absolute space (DiS 2:378).

... differences [in the constitution of bodies] relate exclusively to *absolute* and *original space*, for it is only in virtue of absolute and original space that the relation of physical things to each other is possible (DiS 2:383).

From the transcendental point of view of the *Critique*, Kant's view in *Directions in Space* assigns the status of absolutely independent thing in itself to space, which is in truth a condition of appearances. This is precisely the mistake which Kant ascribes in the *Critique* to the transcendently realistic adherent of the mathematical approach of the antinomy.

To [transcendental] idealism is opposed **transcendental realism**, which regards space and time as something given in themselves (independent of our sensibility). The transcendental realist therefore represents outer appearances (if their reality is conceded) as things in themselves, which would exist independently of us and our sensibility and thus would also be outside us according to pure concepts of the understanding (A369).

On the other hand, the adherent of the metaphysical approach of the antinomy emphasizes the requirement that composites be grounded in simples. In order to avoid the difficulty that the infinite divisibility of space poses for the requirement that objects be composed of simple parts, the adherent of the metaphysical approach of the antinomy argues that space derives from interactions between physical substances

and, therefore, depends on substances, and not the other way around. If space is not a condition of substances, its infinite divisibility does not entail the infinite divisibility of substances.

... the monadists are subtle enough to try to escape from this difficulty by not presupposing space as a condition of the possibility of objects of outer intuition (bodies), but rather presupposing these objects and the dynamical relation of substances in general as the condition of the possibility of space (A441/B469).

As we have seen, the thesis that actual composites consist of simple parts is central to Kant's early doctrine of matter. The pre-critical Kant retains the infinite divisibility of space and the simplicity of substances by arguing that space is not a condition of the possibility of substances, but rather derives from the interaction of substances. Thus, the strategy and conception of the relation between space and physical substances employed by the metaphysician in the antinomy are precisely those adopted by Kant in *Living Forces*, *New Elucidation*, and *Physical Monadology*.

It is easily proved that there would be no space and no extension, if substances had no force whereby they can act outside themselves. For without a force of this kind there is no connection, without this connection no order, and without this order no space (LF §9, 1:23, HK 10).

... place, position, and space are relations of substances, in virtue of which substances, by means of their reciprocal determinations, relate to other substances which are really distinct from themselves... the concept of space is constituted by the interconnected actions of substances (NE 1:414-15).

... since space is not a substance but a certain appearance of the external relation of substances, it follows that the possibility of dividing the relation of one and the same substance into two

parts is not incompatible with the simplicity of, or if you prefer, the unity of the substance (PM 1:480).

In the *Critique*, Kant maintains that the monadist's conclusion that composite objects consist of simple parts would hold if her proof applied to things in themselves (i.e. intelligible entities known through the understanding), and not to objects conditioned by space, namely, appearances.¹²⁹ Furthermore, beginning with *Directions in Space*, Kant never retreats from the view that space is a condition of physical objects – either subjectively as a form of human sensibility through which they are given or objectively as a characteristic of objects themselves independently of our sensibility – and thus that there is a correspondence between the structure of space and the constitution of objects. Accordingly, in the *Metaphysical Foundations of Natural Science* Kant presents the divisibility conflict as follows. We have seen that he argues that if we insist that we know physical objects as things in themselves (i.e. as containing the complete totality of their conditions), we must concede that their division is finite.¹³⁰ Hence, assuming both the finite division of objects and the correspondence between their constitution and the structure of space, we face the dilemma of concluding “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.” Since the former option is rejected as “empty undertaking,” Kant concludes that space cannot be considered objectively a characteristic of things themselves independently of our

¹²⁹ See A441/B469; MF 4:507-08.

¹³⁰ See above, section 3.1.

sensibility. It rather has to be construed subjectively as “the form of our outer sensible intuition” (MF 4:506).

Thus, Kant suggests renouncing the view derived from the mathematical approach that space is an objective property of things themselves, “however common and congenial to the common understanding it may be” (MF 4:506). Instead, Kant regards it transcendently as a condition for experiencing physical objects, or more precisely, the condition of our sensible intuition under which alone external objects can be given to us. In Bird’s formulation, Kant’s transcendental analysis assigns space its proper place in the map of the fundamental elements of our experience as a sensible condition for cognizing physical objects.

If one discards the conception of space derived from the mathematical approach, physical objects need no longer be taken as aggregates of infinitely many actual parts. Instead, the division of physical objects, when considered as appearances in the transcendental sense (i.e. in relation to space as the subjective condition of outer sense), extends only as far as one actually pursues it in experience. And since objects are subjectively conditioned by continuous space, this pursuit will never come to an ultimate point at which one could say that the series of parts and subparts is finite or infinite. Again, as Kant puts it,

the multiplicity of parts in a given appearance is in itself neither finite nor infinite, because appearance is nothing existing in itself, and the parts are given for the very first time through the regress of the decomposing synthesis, and in this regress, which is never given absolutely **wholly** either as finite nor as infinite (A505/B533).¹³¹

¹³¹ In what may at first sight seem to contradict this passage, Kant explains in A523-24/B551-52 that since an external object is given as “a whole in an intuition enclosed within its boundaries” (i.e. an object with a determinate extension in space), its parts are contained “in the intuition of the whole.” Kant, however, immediately adds that “the **whole division** is **not** contained in it.” This means that the parts are contained in the composite object in the sense of simply being present within the boundaries

In a similar way, the metaphysician's dictum that composite objects be grounded in simple parts undergoes a substantial transformation. Instead of construing this dictum ontologically as a principle which affirms the existence of simple parts, Kant transcendently reinterprets it with respect to its function in experience. (As we will immediately see, Kant reinterprets it as a regulative maxim which directs the empirical investigation). Like the adherent of the mathematical approach, the proponent of the metaphysical approach also commits the mistake of transcendental realism, namely, confusing appearances with things in themselves. We have seen that Kant accuses the adherent of the mathematical approach of assigning the status of thing in itself to what pertains to appearances (i.e. to space). The metaphysician, on the other hand, tries to apply the principle that composite things in themselves consist of simples to appearances.

Kant does not entirely reject the metaphysician's claim that "reason must... think of [elementary substances] as the primary subjects of all composition and hence think of them prior to it as simple beings" (A436/B464). He rather argues that one must distinguish what reason must *think* of objects in general from the way objects in the world are *given* to us. Therefore, the necessity to think of composite objects as composed of simple parts is not to be taken as validating the view that physical objects actually consist of simple parts. Rather, it has to be understood as an instruction to extend the search for ever smaller parts as much as possible. This search is set for us as a task to be pursued, a task achieved "only through one's actually completing it" (A500-01/B529).¹³² Thus the question is not whether the series of parts

of the object, and not in the sense that they are already differentiated as its distinct constituents. With respect to the latter, Kant reaffirms that it is only "the progressive decomposition... which first makes the series [of the parts] actual."

¹³² Cf. Kant's claim in the *Metaphysical Foundations of Natural Science*: "one can only say of appearances, whose division proceeds to infinity, that there are just so many parts in the appearance as

of a physical object is finite or infinite, but rather how far one has gone in one's inquiry into its parts.

Kant expresses this point in a general way in his transcendental examination of the major premise of the dialectical syllogism (i.e. the claim that if the conditioned is given, then the whole series of all conditions for it is also given). Understood metaphysically, this is an ontological principle which may be valid for things in themselves, but cannot also apply to empirical objects. If, however, the principle is properly reinterpreted as a subjective, regulative rule, it becomes an essential maxim that guides empirical investigation. The regulative counterpart of the ontological principle reads: "If the conditioned is given, then through it a regress in the series of all conditions for it is **given** to us **as a problem**" (A497-98/B526).¹³³

The regulative rule in the case of divisibility holds that insofar as material objects are *given in space*, they can be divided indefinitely. This rule therefore instructs the inquirer never to assume that the current division of matter is final, since each part in each stage of the division is itself divisible. The "given in space" qualification is important for understanding the meaning of the divisibility regulative rule and for determining what falls under its jurisdiction. In the remainder of this section, I will clarify this point by examining Strawson's criticism of this rule.

3.3.1 A remark on Strawson's understanding of the regulative rule

Strawson considers Kant's regulative rule in comparison with actual developments in science and argues that a sub-atomic physicist is not in fact engaged in an endless task

we may provide, that is, so far as we may divide. For the parts, as belonging to the existence of an appearance, exist only in thought, namely, in the division itself. Now, the division does of course proceed to infinity, but it is still never given as infinite. Thus it does not follow, from the fact that its division proceeds to infinity, that the divisible contains an infinite aggregate of parts *in itself*, and outside of our representation" (MF 4:507).

¹³³ See also A307-08/B364-65.

of successive divisions of matter to ever smaller parts. The obligation of the physicist is not to successively decompose matter but to continually improve her theory. She has to account for what is yet unexplained or arbitrary in her theory. Although the series molecule-atom-electron bears some analogy to the series implied in the regulative rule, theoretical advances do not necessarily consist in decomposing material particles into yet smaller ones. Certain theoretical advances and revisions simply consist in additions of further elementary particles to particles previously considered elementary. The newly discovered particles, together with the equally elementary older ones, are supposed to yield a fuller explanation and thus a better theory. Kant's conception of the analysis of matter has a "primitive simplicity" which makes it only remotely analogous to the actual procedures of physicists.¹³⁴

Strawson seems to confound two different questions: (1) how many levels of internal organization matter has and (2) how far the division of matter in space proceeds. Strictly speaking, Strawson's series of molecule-atom-electron concerns different levels of internal organization of physical bodies. In this respect, the analysis of matter has to yield a definite outcome in each stage, that is, it has to indicate parts with specific functions and certain organization. The regulative rule, by contrast, concerns "the subdivision of an appearance *as a mere filling of space*" (A526/B554, italics added). In this case, what guides the division is the structure of space. Because space is homogeneous, the division can be executed in numerous ways and is not limited to determinate, organized structures. Except for simply being parts of the divided objects, the parts generated in this division have no specific function.

Strawson clearly has the first question in mind, while Kant's regulative maxim concerns only the second. Kant's rule thus merely states that every division can be

¹³⁴ Strawson, 1966, pp. 203-04.

followed by a subdivision, with utter indifference to the way the division is carried out or to its specific outcome. As such, it is not supposed to explain how to actually proceed either in the decomposition of matter or, and more importantly for the microphysicist, in the investigation of elementary particles, their properties and relations, and their organization in the composite object. Thus, Kant's regulative rule does not capture the actual procedure by which microphysicists produce their conceptual models, but it was never meant to do so.

As a matter of fact, Kant's discussion of matter does refer to Strawson's concern with internal organization. Kant contrasts the indeterminate division of objects considered as mere filling of space with a definite decomposition of objects considered as organized wholes. In the latter case the division results in well-defined parts that figure in an ordered structure. The division of an organism into its organs is an example of this type of division. Strawson's series of molecule-atom-electron resembles such a division more than the first, indeterminate type of division, since the division of materials into molecules and atoms does not rest merely on their filling space, but rather on the organized structures which atoms and molecules constitute. Kant maintains that in definite decomposition into organized structures, one has no guarantee that the series of divisions will also extend indefinitely. Whereas the divisibility of matter in space is a *transcendental* problem which has a critical solution, the internal organization of objects is an *empirical* issue which we are obliged to leave to experience to decide.

The infinite division indicates only the appearance as *quantum continuum*, and is inseparable from the filling of space; for the ground of its infinite divisibility lies precisely in that. But as soon as something is assumed as a *quantum discretum*, the multiplicity of units in it is determined; hence it is always equal to a number. Thus only experience can settle how far the

organization in an articulated [*gegliederten*] body may go... But how far the transcendental division of an appearance in general may reach is not a matter of experience at all, but it is rather a principle of reason never to take the empirical regress in the composition of what is extended, in conformity with the nature of this appearance, to be absolutely complete (A527/B555).

As we will see, Kant presents further regulative maxims which pertain to the analysis of organized objects in the third *Critique*. However, these maxims concern complex, organized objects which involve purposiveness, and thus pertain to organisms, but not to physical objects. Perhaps these maxims could be analogously applied to the latter as well. In any case, the divisibility regulative rule of the second antinomy pertains quite generally to matter insofar as it fills space. Strawson is correct in stressing that, as such, it is not specific enough to capture the actual procedures of microphysicists. Yet Kant did not intend this rule to do so by itself. Thus, Kant's teaching is not in conflict with certain actual scientific advances, as Strawson implies. There are several possible paths that scientific progress may follow, each of which may require different rules. The third *Critique's* rules concerning the analysis of organized structures are an example. In any event, it does not seem that Kant aspired to provide a set of maxims which constitute a detailed recipe for physicists and natural scientists or specific blueprints for each and every scientific discipline. As Kant has made clear in the Dissertation, science advances primarily by means of trial and error.¹³⁵ The transcendental principles of the Analytic draw the very general features of the field of

¹³⁵ The context is the distinction between the methods of philosophy and science. Kant argues that in philosophy, the method precedes the doctrines, whereas in science practice shows the method by which to advance. The relevant passage reads: "In all the sciences of which the principles are given intuitively, whether it be by sensory intuition (experience) or by sensitive but pure intuition (the concepts of space, time and number), that is to say, in natural science and mathematics, *use gives the method*. After a science has attained a certain fullness and orderliness, trial and error show what path and what procedure must be pursued if it is to be brought to completion, and made to shine the more purely, once the blemishes both of mistakes and of confused thoughts have been eliminated" (Diss §23, 2:410, author's italics).

investigation, while the regulative maxims of the Dialectic point to certain directions of inquiry, but neither one nor both together is a replacement for the trial and error and creativity of researchers as vehicles for concrete scientific results.

Chapter 4: The Pre-Critical Accounts of the Size of the World

Unlike the question of composition and divisibility, which Kant recognized as problematic at a rather early stage of his intellectual career, the question of the size of the world in time and space¹³⁶ (i.e. the topic of the first antinomy) did not appear to Kant as presenting a fundamental problem or a bone of contention between the metaphysical and the mathematical approaches. Whereas Kant's discussions of the divisibility problem reveals the development of his thinking on the fundamental opposition between the two approaches beginning with the pre-critical texts, continuing in the Dissertation, and ending with the critical turn in the *Critique of Pure Reason*, one could argue that, with respect to the question of the size of the world, Kant remained not only in dogmatic slumber, but in a deep sleep, since he only first recognized the question as problematic in the Dissertation of 1770. Prior to the Dissertation, Kant believed that the cosmological question concerning the size of the world could be readily addressed by metaphysical considerations or by mechanical accounts.

Moreover, despite the fact that his pre-critical doctrines implied different answers to the question concerning the size of the world, Kant nevertheless dogmatically asserted in certain early texts (i.e. *New Elucidation*, the *Universal Natural History*, and the *Only Possible Argument*) that the world has a beginning in time. He thereby endorsed the position of the metaphysical approach and ignored that of the

¹³⁶ For the sake of brevity, I will focus in this chapter and the following on the temporal part of the problem, namely, whether the world has a beginning in time or whether it exists eternally.

mathematical approach, according to which the world exists eternally and has no beginning in time.

In *New Elucidation*, Kant considers the world from the point of view of the metaphysical approach, while in the *Universal Natural History* he examines it from the perspective of the mathematical approach. These two texts present different accounts of the character of the world and the relations between its components. Even though each account implies a different answer to the question concerning the size of the world, in both texts Kant maintains that the world has a beginning in time. In the *Only Possible Argument*, Kant attempts to reconcile and combine the two accounts. However, even in this text, Kant explicitly contends that the world has a beginning in time, despite the fact that his discussion implies a more complex, Platonist position, according to which the matter of the world and the necessary order that derives from the laws of matter are eternal, while a higher type of order was established by God in a certain point in time.

In the Dissertation, Kant examines the notion of a “world” in general, identifying three elements in its definition: the matter of the world (the things or substances that compose the world), the form of the world (the relations between the things that compose the world), and the entirety of the system of the world (the totality of the world’s component parts). The latter element makes the notion of the world problematic. On the one hand, reason requires one to think of the world in its entirety as finite, while on the other hand the conditions of sensible conditions require one to represent the world as a whole that expands in infinite time and space. Kant believed it was possible to resolve this problem by means of the central thesis of the Dissertation, namely, the separation of two different realms of reality: an intellectual world known through reason and a sensible world known through sensibility. The

separation thesis made it possible for Kant to endorse the conflicting claims of the two approaches by maintaining that the view derived from the metaphysical approach concerning the finitude of the world pertains to the intellectual world, while the view derived from the mathematical approach concerning the infinitude of the world applies to the sensible world.

In the present chapter, I focus on the pre-critical treatment of the question of the size of the world. I will deal with Kant's account of the problem in the first *Critique's* in the following chapter. The chapter is divided into four parts. In the first two sections, I consider the conflicting cosmological views of the *Universal Natural History* and *New Elucidation*, respectively. In the third section, I analyze the reconciliation between these views implied in the *Only Possible Argument*. As we will see, Kant's discussions of the problem of the size of the world in these three texts are intimately related to the question of the relation between God and the world. By contrast, in his account in the Dissertation, which I present in the fourth and final section, Kant focuses on the notion of the world itself and reveals the conceptual problems it contains for the first time.

4.1 The Eternity of the World in the *Universal Natural History*

The title of the *Universal Natural History* indicates that this work purports to provide an account of the development and current structure of the entire universe “according to Newtonian principles.”¹³⁷ Kant attempts to present a mechanical explanation of the development and structure of the universe, namely, to explain the history and the

¹³⁷ The full title of the book is *Universal Natural History and Theory of the Heavens, or Essay on the Constitution and Mechanical Origin of the Entire Universe, treated according to Newtonian Principles*. Section 2.7.3 of the *Only Possible Argument* offers a succinct summary of the cosmological theory presented in the *Universal Natural History*.

features of the universe by means of matter, motion, and forces. In other words, in the *Universal Natural History* Kant considers the world from the perspective of the scientifically-oriented mathematical approach. Kant postulates an initial state in which primitive material elements were dispersed in space and from which an orderly system began to take shape by means of the forces inherent in matter. This process started around the point at which the most massive elements were located, which Kant claims is the “physical center” of the universe. This postulate, along with the role which Kant assigns to God, may seem to suggest that the world began at some point in time by means of a divine intervention. I argue in this section that despite Kant’s claim to the contrary, his mechanical account of the world in the *Universal Natural History* implies, or is at least consistent with, the idea that the development of the world proceeds in an endless cycle and thus has no beginning in time. This section is divided into three parts. After briefly presenting the mechanical theory of the *Universal Natural History* in the first part of this section, I argue in the second part that this theory implies that the world has no temporal limit (i.e. has no beginning in time). In the third part, I conclude this section with a remark on the “Newtonianism” of the *Universal Natural History*.

4.1.1 The Universal Natural History’s mechanical account of the origin of the world

Kant begins his mechanical account with a hypothesis concerning the initial condition of the universe. For the sake of brevity, let us confine ourselves to Kant’s account of the formation of the solar system.¹³⁸ On this hypothesis, the matter of the celestial bodies of the solar system originally existed in the form of primary elements and was

¹³⁸ Kant’s account of evolution of the universe is similar to that of the formation of the solar system and rests on the same principles.

equally diffused throughout the space which the solar system currently occupies. The chaotically spread, elementary and formless material stuff was not homogeneous. It contained a wide variety of sorts of elements differing in density and attraction. This variety was what first stimulated matter to shape itself out of the chaos.¹³⁹ The most dense and powerful elements within this variety were exceedingly rare and hence quite remote from one another.¹⁴⁰

In such a condition, a state of rest cannot last. Since elements are endowed with essential forces of attraction, and since there is no equilibrium between these forces, motion ensues immediately. The highly dense and sparse elements draw the less dense matter in their vicinity toward themselves. Larger masses are formed in this way. These larger masses, whose attractive powers are now increased, draw even more matter toward themselves from farther regions in space. This process results in the formation of the large celestial bodies.¹⁴¹

If the formation process had stopped at this point, the result would have been several large masses permanently at rest.¹⁴² The force of repulsion, another essential force effective in the formation of the planetary system, prevents this outcome. As they fall toward a denser point, elements repel one another, thereby diverting one another from falling in a straight and perpendicular manner. Thus, elements are affected by two forces as they fall toward a massive, central body: a perpendicular force resulting from the attractive power of the central body and a lateral force

¹³⁹ If elements were completely devoid of form and character, there could not have been diversity and variety among the elements. Moreover, given their equal diffusion, there would have been nothing to stir the formation of nature; nature would have persevered in its formless equilibrium. Accordingly, Kant characterizes the first condition of nature not as completely formless, but “as raw, as unformed, as possible” (UNH 1:263, J 114).

¹⁴⁰ UNH 1:263-64, J 114-15.

¹⁴¹ UNH 1:264, J 115.

¹⁴² Compare this with the discussion of the constitution of the “fixed stars” in the first part of the book, in which Kant argues that if stars had been bounded by attraction alone, they would have fallen together into *one* lump (UNH 1:250, J 103).

resulting from mutual repulsions among the various elements.¹⁴³ Elements which gain the appropriate lateral or tangential velocity will continue to revolve around the central body. Those which do not will fall toward the central body and merge with it.¹⁴⁴ In this way, the mutual repulsions and deflections eventually result in orbital motions around the center, toward which the particles were falling. That is, a cloud of particles of matter revolving around a dense, attractive center takes form.¹⁴⁵

At first, the orbits of the particles intersect one another. They collide, thereby blocking and hindering one another. Particles that decelerate beyond a certain degree

¹⁴³ According to Kant's initial analysis, a circular motion of a body requires two forces: a propulsive force (*schießende Kraft*), providing lateral velocity by which the body would go on indefinitely in a straight line if it were not attracted by some other force; and a centripetal force (*Centripetalkraft*), identified with gravitation or force of attraction, which draws the body directly toward the center. A certain balance between these two forces is required for orbital motion (UNH 1:243-45, J 98-100). We would say that circular motion requires one force (i.e. centripetal force), and that this force and the square of the tangential velocity of the body should observe a certain relation. Kant comes close to this formulation later on, when he speaks of the "combination" between "the sinking force" (*sinkende Kraft*) and the "thrustlike motion" (*schießende Bewegung*) (UNH 1:334, J 171), or of the "connection" between "the once implanted impulse" (*einmal eingepflanzte Schwung*) and the "central force" (*Centralkraft*) (UNH 1:340, J 175). Similarly, he considers the "balance" between the "lateral swing" (*Seitenschwung*) or "lateral motion" (*Bewegung zur Seiten*) and gravitation in OPA 2:146. In his second letter to Bentley, Newton employs similar terms to explain that "if the earth (without the moon) were placed any where with its center in the *Orbis Magnus* and stood still there without any gravitation or projection, and there at once were infused into it both a gravitating energy toward the sun, and a transverse impulse of a just quantity moving it directly in a tangent to the *Orbis Magnus*; the compounds of this attraction and projection would, according to my notion, cause a circular revolution of the earth about the sun. But the transverse impulse must be a just quantity; for if it be too big or too little, it will cause the earth to move in some other line" (Newton, 1958, pp. 296-97).

¹⁴⁴ A circular orbit around a central massive body with mass M requires that the velocity of the orbiting body v would be equal to $\sqrt{\frac{GM}{R}}$ (R is the distance between the centers of the two bodies; G is the gravitational constant). If the velocity of the body is somewhat higher or lower than this value, it will follow an elliptical curve around the central body. If the velocity is too low, the elliptical curve produced will go through the central massive body and the revolving body will collide with it. If the velocity is too high, it will escape from the central body's sphere of gravitational influence. It follows from considerations of energy that escape velocity (i.e. the minimal speed an object must have in order to break free from the gravitational field of a celestial body with mass M) is $\sqrt{\frac{2GM}{R}}$.

¹⁴⁵ UNH 1:264-65, J 115. For Newton, the diversion from perpendicular fall and the precise measure of lateral motion required for circular orbits prove the intervention of God in forming the solar system. In his letters to Bentley, Newton attributes the production of proper lateral motion, which Kant attributes to the force of repulsion, to the divine hand: "though gravity might give the planets a motion of descent toward the sun, either directly or with some little obliquity, yet the transverse motions by which they revolve in their several orbs, required the divine arm to impress them, according to the tangents of their orbs." The "obliquity of descent" to which Newton refers does not result from repulsion, but rather from mutual attraction between the falling bodies. This natural obliquity, however, would bring about at most eccentric, comet-like orbits. It is not sufficient for the formation of circular concentric orbits around the central body (Newton, 1958, pp. 305-06, 310-11, and see also pp. 297-98).

will fall toward and merge with the central body, as explained above. These particles increase the mass of the massive body in the center, namely, the sun. Eventually, only the particles which block and hinder one another the least remain in motion. Particles hinder each other the least when they revolve in the same direction and in parallel orbits which do not intersect one another, and hence in one plane. The direction attained in this way is that of the rotation of the sun around its axis; the plane is that of the equator of the sun. Thus, the uniformity of the motion of particles in the same direction and in concentric, parallel orbits in a common plane around the sun is achieved naturally by means of mechanical causes.¹⁴⁶

At this stage in the development of the solar system, particles move in an organized manner in parallel clusters in the vicinity of one plane around the sun. These clusters of particles eventually become planets in the following way. Particles close to one another in a certain cluster orbit in parallel with equal velocity. Relative to one another, they are nearly in a state of rest. This makes it possible for the denser particles in each cluster to collect the particles nearest them in virtue of their powers of attraction.¹⁴⁷ Again, the newly merged collections of particles become denser and more powerful and thus extend their sphere of attraction to draw elements from farther regions. As this process continues, loose clusters of revolving particles of matter finally become integrated into firmly tightened masses revolving around the sun, namely, planets.¹⁴⁸

¹⁴⁶ UNH 1:265-66, J 115-16.

¹⁴⁷ Kant notes that these attractive forces are different from the Newtonian gravity. The latter is much too slow and weak in such tiny elements to stir the formation of the planets. Thus, the planets are first formed through “the concourse of a few elements which unite through the customary laws of coherence” (Kant offers no explication of these “customary laws”). Newtonian attraction only becomes efficacious after sufficiently large portions of elements join together (UNH, 1:267, note, J 117).

¹⁴⁸ UNH 1:266-68, J 116-17.

Kant explains specific features of the solar system in a similar way.¹⁴⁹ He also explains the evolution of the entire universe in a manner analogous to his explanation of the formation of the solar system. Furthermore, as we will see in chapter 6, Kant offers a more daring conjecture with regard to the mechanical basis of the differences between the inhabitants of various planets. This completes the mechanical account of the world of the *Universal Natural History*.

4.1.2 The eternity of the universe

Kant speaks of “the first formation of nature” and “the universal center” of nature, around which the evolution of nature had initially begun (UNH 1:307, J 149; 1:320, J 160; 1:311, J 152).¹⁵⁰ I wish to argue, however, that this claim does not seem to be an essential part of the cosmological theory of the *Universal Natural History*. The core thesis of Kant’s theory accords with the view that there are multiple attractive centers around which systems form and decay in an endless cycle without beginning or end. Furthermore, I will argue that Kant’s theological apologetics, which attempt to show that his mechanical cosmology is not in conflict with the traditional conception of creation, is unsatisfactory.

According to Kant’s theory, organized systems in the universe not only naturally evolve as a result of the laws and forces of matter, but also decay and lapse into disorder due to these very same factors. Kant notes that Newton also saw himself as compelled to predict the decay of nature by “the natural tendency” (*natürlicher Hang*) inherent in its mechanics (UNH 1:317-18). Newton describes certain irregularities in the planetary system “which may have risen from the mutual actions of comets and

¹⁴⁹ Kant explains the axial rotation of the planets and the origin and motions of the comets and satellites in an analogous manner and with the same principles. He summarizes this cosmological theory in UNH 1:338-41, J 174-76 and in OPA 2.7.3, 2:144-47.

¹⁵⁰ Cf. UNH 1:314: “The creation is never completed. It has indeed once begun, but it will never cease.”

planets upon one another, and which will be apt to increase, till this system wants a reformation.”¹⁵¹ Presumably, such a restoration will be provided by the one who set the system in the first place, namely, God. Leibniz, on the other hand, rejects the idea that God has to supernaturally intervene in the world He created in order to repair naturally caused irregularities. In his second letter to Clarke, he claims that the material world is “a watch that goes without wanting to be mended by [God]: otherwise we must say, that God bethinks himself again. No; God has foreseen every thing; he has provided a remedy for every thing before-hand; there is in his works a harmony, a beauty, already pre-established.”¹⁵² In the following letter, Leibniz clarifies that it is not the case that God allows “disorders to happen” and then finds remedies for them, but rather that “he has found a way before-hand to prevent any disorders happening.”¹⁵³

In other words, for Newton, naturally caused irregularities in the supernaturally-formed planetary world are mended supernaturally by divine intervention. Leibniz claims that irregularities cannot occur in the supernaturally-created material world, which implies that supernatural intervention in nature is unnecessary. Kant argues, by contrast, that organized planetary systems naturally evolve and then decay without supernatural reparation.¹⁵⁴ Like any other finite thing, every organized world must

¹⁵¹ *Opticks*, p. 402.

¹⁵² Leibniz’s second letter to Clarke, §8.

¹⁵³ Leibniz’s third letter to Clarke, §14.

¹⁵⁴ Kant provides several reasons to support his view that the order of nature is the effect of the essential laws and forces of natural things, and not something imposed directly by the hand of God. First, Kant argues that the forces of bodies and natural laws account for the specific features of the universal system (i.e. the motion of the planets in one direction and one plain in concentric circles, their densities and sizes, the distances between their orbits, etc.). He claims that if these forces and laws are ignored and the “hand of God” is introduced instead, these specific features of the system would seem arbitrary and inexplicable: “in the case of a construction flowing directly from the divine Will, there is not the slightest ground to come across the relations under consideration.” Thus, “all this shows that the first cause was tied to the mechanical rules of motion and did not act through a free choice” (UNH 1:334-36, J 170-72; 1:341-45, J 176-79). Second, Kant maintains that if one assumes that order cannot be achieved by natural laws and is interpreted as imposed by God, “then one is obliged to turn the entire nature into a miracle.” Any event or object exhibiting uniformity and order will therefore be

“pay off its duty to transience” (*der Vergänglichkeit ihr Gebühr abtragen*, UNH 1:319).

The natural decay and lack of supernatural reparation in Kant’s cosmology do not mean that the universe is doomed. Material systems contain within themselves the resources to rearrange themselves anew from the disorder into which they fall. Orderly systems in the universe endlessly decay and rearrange by means of attractive and repulsive forces and according to natural laws. The relevant passage is worth quoting in full.

Can we not believe that Nature, which was capable of developing herself out of chaos into a regular order and into an arranged system, is likewise capable of re-arranging herself again as easily out of the new chaos into which the diminution of her motions has plunged her, and to renew the former combination? Cannot the springs which put the stuff of the dispersed matter into motion and order, after the stopping of the machine has brought them to rest, be again put into action by extended forces; and may they not by the same general laws limit each other until they attain that harmony by which the original formation was brought about? It will not need long reflection to admit this, when it is considered that after the final exhaustion of the revolving movements in the universe has precipitated all the planets and comets together into the sun, its glowing heat must obtain an immense increase by the commingling of so many and so great masses... This fire, thus put by new nourishment and the most volatile matter into the most violent conflagration, will undoubtedly not only resolve everything again into the smallest elements, but will also disperse and scatter these elements again in this way with a power of expansion proportional to the heat, and with a rapidity which is not weakened by any resistance in the intervening space; and they will thus be dissipated into the same wide regions of space which they had occupied before the first formation of nature. The result of this will be that, after the violence of the central fire has been subdued by an almost total dispersion of its mass, the

inexplicable in natural terms (UNH 1:332-33, J 169). Finally, Kant contends that in this way one will not only be unable to provide a naturalistic explanation of phenomena, but will indeed destroy the very concept of nature. That is, on such a view, nature is replaced with “God in the machine to bring about the changes in the world” (UNH 1:333, J 169).

forces of attraction and repulsion will again combine to repeat the old creations and the systematically connected movements, with not less regularity than before, and to present a new universe. If, then, a particular planetary system has fallen to pieces in this way, and has again restored itself by its essential forces, nay, when it has even repeated this play more than once, then at last the period will approach which will gather in the same way the great system of which the fixed stars are members into one chaos through the falling of their movements. Here it will still less be doubted that the reunion of such an infinite multitude of masses of fire as these burning suns are, together with the train of their planets, will disperse the matter of their masses when dissolved by the ensuing unspeakable heat into the old space of their sphere of formation, and will there furnish materials for new productions by the same mechanical laws, whereby the waste space will again be animated with worlds and systems. When we follow this Phoenix of nature, which burns itself only in order to revive again in restored youth from its ashes, through all the infinity of times and spaces... then the spirit which meditates upon all this sinks into profound astonishment (UNH 1:320-21, H 152-54).¹⁵⁵

According to Kant's cosmology, nature evolves in an endless cycle. Despite his claim to the contrary, Kant's theory suggests that this cycle has no beginning as well. On Kant's account, the principles and forces that propel the development of the world are *immanent* in the essence of matter. Therefore, the motive forces of matter and the laws which govern their operation are *necessary*.¹⁵⁶ They are responsible for (1) the process by which a cosmos is generated out of chaotically-spread matter in space, (2) the regularities observed in the generated, orderly universe, (3) the universe's fall into disorder and its decomposition into primitive elements, and (4) the regeneration of an orderly universe out of the chaos. Our universe could exist eternally by virtue of these

¹⁵⁵ Newton considers the idea of the "phoenix of nature" and comments: "the growth of new systems out of old ones, without the mediation of a divine power, seems to me apparently absurd" (Newton, 1958, p. 302).

¹⁵⁶ Recall that according to the *Physical Monadology* the inherent forces of attraction and repulsion constitute the possibility of matter. They are necessary and essential, for without them there would be no matter at all.

principles without special divine creation. Thus, it is unnecessary for God to institute lawfulness and order in the universe and there is no reason why the cycle of the world must have a beginning.¹⁵⁷

Kant was aware of the fact that his cosmology might be considered anathema to religion and was keen to ward off the charge of atheism. Most of his preface is dedicated to apologetics. Recognizing the similarities between his theory and the doctrines of the impious classical atomists, Kant tried to establish the differences between his system and theirs. In line with Newton's claim that "blind fate" could never bring about the regularities observed in the planetary system,¹⁵⁸ Kant argued that the fact that nature could evolve from chaotic matter into a cosmos was not an "accidental chance," as with the classical atomists, but rather indicated the

¹⁵⁷ Kant's thesis fits what Alfred North Whitehead labels the "doctrine of immanent law." Whitehead distinguishes two rival doctrines of laws of nature. The one asserts that the laws of nature are immanent in the essences of things, while the other asserts that they are imposed on things by an external entity (Whitehead, 1933, pp. 142-51). According to the former, "the order of nature expresses the characters of the real things which jointly compose the existences to be found in nature. When we understand the essences of these things, we thereby know their mutual relations to each other" (ibid., p. 142). In other words, this view involves a thesis of "internal relations," which implies that laws of nature are derived from certain relations between essences of natural things.

Two features of Kant's theory in particular accord with Whitehead's doctrine of immanent law and strengthen the claim that Kant's theory implies that the world has no beginning: the dispensability of an "absolute being" who commends order and the absence of perfect regularities in the world system. Concerning the first, Whitehead notes that it is "evident that the doctrine involves the negation of 'absolute being'" (ibid., p. 142). Recall that the formal goal of the *Universal Natural History* is to demonstrate that "the world recognizes for the origin of its constitution a mechanical development unfolding from the general laws of nature" (UNH 1:334, J 170. See also UNH, 1:221-222, J 81). It is indeed unnecessary for God to organize the world if chaotic, raw matter can form itself into an ordered world, assisted only by its inherent forces. Concerning the second feature of Whitehead's doctrine of immanent law, namely the absence of perfect regularities in nature (see Whitehead, 1933, p. 143), we may note that Kant regarded imperfect regularities as the hallmark of the "hand of nature." For Kant, these irregularities demonstrate that the order and laws were not imposed upon the universe by the free will of God. Planets and moons, for example, do not revolve in perfect circular orbits, and even though they revolve quite closely to one common plane, they do deviate from it. But since the order of the universe was not imposed by God, and since it is not a law enacted by the divine free will that planets and moons should orbit in perfect concentric circles in one plane, it should not come as a surprise that these deviations do in fact occur in nature (see UNH 1:246, J 100; 1:269, J 119; 1:337, J 172-73; 1:347, J 181).

¹⁵⁸ See *Opticks*, p. 402.

dependence of nature on a supreme understanding.¹⁵⁹ In certain places, Kant even appears to endorse a voluntaristic view. For instance, he states that “God has deposited in the forces of nature a certain secret art so that it may develop itself from the chaos into a perfect world system” and talks about laws “which are prescribed to substances for their interaction [and which] are not a principle autonomous and necessary regardless of God” (UNH 1:229, J 87; 1:332, J 169).

These claims, however, are not further substantiated by common voluntaristic assertions that this “secret art” and these prescribed laws depend on the free will of God, that God could change the laws or the essences of things from which they are derived, or that He can suspend or alter the laws after they are enacted. Nowhere does Kant claim that God voluntarily created the material elements which compose the universe *ex nihilo* and subordinated them to laws subjected to his free choice.¹⁶⁰ On

¹⁵⁹ UNH, 1:221-28, J 81-87. Similar remarks are scattered abundantly elsewhere in the text. See, for example, 1:263, J 114; 1:293-94, J 138; 1:332-33, J 168-69; 1:346, J 180. For a discussion of Kant’s attempt at apologetics, see Polonoff, 1973, pp. 110-13.

¹⁶⁰ The closest Kant comes to enunciating an idea reminiscent of this is in UNH 1:318, J 158, but even this hardly supports the voluntaristic cause. Compare, by contrast, the view of a staunch voluntarist such as Robert Boyle. Boyle considers God the creator and architect of the world. On Boyle’s view, not only did God voluntarily bring the world into being in accordance with his wise plan, He also freely contrived the plan itself and the laws on which it was based: “the laws of motion, without which the present state and course of things could not be maintained, did not necessarily spring from the nature of matter, but depended upon the will of the divine author of things” (*The Christian Virtuoso*, in *The Works of Robert Boyle*, vol. 11, p. 302). Since God freely established the laws of nature, he can also modify them: “... if we consider God as the author of the universe, and the free establisher of the laws of motion, whose general concurrence is necessary to the conservation and efficacy of every particular physical agent, we cannot but acknowledge, that by with-holding his concurrence or changing these laws of motion, which depend perfectly upon his Will, he may invalidate most, if not all, the axioms and theorems of natural philosophy: These supposing the course of nature, and especially the established laws of motion among the parts of the universal matter, as those upon which all the *phaenomena* of nature depend” (*Some Considerations about the Reconcilableness of Reason and Religion*, section 3, *Works*, vol. 8, pp. 251-52). See also *A Free Enquiry into the Vulgarly Received Notion of Nature*, section 1, p. 14; section 4, pp. 69-70; section 6, pp. 99-101; section 8, pp. 160-63. Locke adopts a similarly voluntaristic view and accordingly explains that “the original rules and communication of motion being such, wherein we can discover no natural connexion with any ideas we have, we cannot but ascribe them to the arbitrary will and good pleasure of the wise architect” (*Essay Concerning Human Understanding*, 4.3.29). In the same spirit, Newton remarks that “it may be... allowed that God is able to create particles of matter of several sizes and figures, and in several proportions to space, and perhaps of different densities and forces, and thereby to vary the laws of nature, and make worlds of several sorts in several parts of the universe. At least, I see nothing of contradiction in all this” (*Opticks*, pp. 403-04). Elsewhere, however, Newton seems more cautious with respect to the possibility of different laws and constitutions of matter (see *On the Gravity and Equilibrium of Fluids*, p. 138).

the contrary, he modifies his seemingly voluntaristic claims so as to accord with his general teachings in the *Universal Natural History*. He claims that the prescribed laws are not autonomous, but somehow dependent on God. He then explains the nature of this dependence by claiming that the “essences [*Wesen*] of all things must have their common origin” in God and that “their properties have their source in a single highest intellect” (UNH 1:332, J 169). According to this view, the *eternal* essences and fundamental laws of things have their seat and origin in God’s divine scheme. But there is no suggestion that God can change this scheme with its eternal laws, or that other possible worlds with different plans are available for his choice.¹⁶¹ Furthermore, Kant argues that “the basic matter [of the universe], whose qualities and forces lie at the basis of all changes, is an immediate consequence of the divine existence” (UNH 1:310, J 151).¹⁶² That is to say, matter is a *consequence (Folge)* of the divine *existence (Dasein)*, not a product or an effect of God’s will. If God is an eternal, necessary being, its “immediate consequence” (*unmittelbare Folge*), also exists necessarily and eternally. Therefore, the material world exists necessarily and is temporally coextensive with God, which means that it exists eternally, without beginning or end.

It is therefore doubtful whether Kant’s apologetics are successful. His theory is a version of a necessitarian system of an eternal world bound by natural necessity. It implies a conception of creation which is different from the traditional one. Creation

¹⁶¹ It is important to note the difference between the plurality of possible and actual worlds in *Living Forces* (§§7-11, 1:21-25, HK 8-13) and *New Elucidation* (1:414) on the one hand, and in the *Universal Natural History* on the other. In the former, Kant argues for the metaphysical possibility of a multiplicity of separate, solitary worlds with distinct laws and kinds of space. God could choose to simultaneously realize many such worlds, but since this seems less perfect, such a multiplicity, though possible, is improbable. In the *Universal Natural History*, Kant also talks of “worlds without number and without end,” but only as parts of one and the same single system of the whole universe. The infinitely many “worlds” are interconnected by the same essential forces and according to the same laws and thus constitute a single universe (see 1:310-12, J 151-53, and also 1:255-56, J 108). In essence, if one can meaningfully talk here of a divine plan or scheme, one must admit that the God of the *Universal Natural History* had only one plan at his disposal.

¹⁶² See also UNH 1:223, J 82: “the universal laws of matter are... a consequence [*Folge*] of the highest plan.”

in Kant's cosmology is not an act guided by a wise contemplation, but rather an eternal emanation or derivation from the necessary being.¹⁶³ As Martin Schönfeld observes, on Kant's conception, creation

is... a work-in-progress; and as this mechanical self-creation is not even done yet, Kant's cosmogony contradicts the Bible... No one deviated from the theological standard as widely as he did, and it is no surprise that he published *Natural History* in 1755 anonymously.¹⁶⁴

Schönfeld points out the revolutionary aspects of Kant's cosmogony and argues that for Kant, God himself is immanent in nature.¹⁶⁵ It is crucial to note, however, that what is immanent in nature is not an intelligent agent who intentionally operates within it. It is rather "cosmic DNA," that is to say, laws to which matter conforms and forces which activate it. Admittedly, Kant aims to make his theory conform to

¹⁶³ In this respect, the notion of creation presented in the *Universal Natural History* resembles classical and medieval deterministic emanation doctrines of creation, according to which God's creation is not based on a free decision to bring a world into being, but is rather an eternal, necessary emanation in accordance with strict causal lawfulness. For a discussion of Neoplatonic and scholastic doctrines of emanation, together with ample reference to sources, see O'Neill, 1993, pp. 32-37. Kant's cosmogony and the Neoplatonic and scholastic accounts of creation share at least two common features. First, in neither case does creation involve volition or depend on God's will. Second, and particularly important to the present discussion, if creation is to be understood in terms of derivation or emanation from the necessary being, it cannot have a beginning in time. There cannot be a time in which a necessary being failed to subsist. Likewise, there cannot be a period of time in which that which necessarily emanates from a necessary being failed to emanate and did not exist. Despite Kant's assertion to the contrary, then, what holds good for Thomas Aquinas must be true for Kant as well: "if things have eternally emanated from God, we cannot give a time or instant at which they first flowed forth from God" (Aquinas, *Summa Contra Gentiles*, 3.65.8).

¹⁶⁴ Schönfeld, 2006, p. 55.

¹⁶⁵ Schönfeld writes: "Comparing Kant's with the then standard account shows how revolutionary his theory is. The Bible involves a distinction between God and cosmos. Creator and creation differ like artist and sculpture, or like author and book. And whereas God is supernatural, nature *à la* Augustine is 'beneath' God. But Kant argues, to the extent that one can speak meaningfully of 'god' at all, divinity is a telic possibility, the engine of progress. Kant's god is inside nature; it is cosmic DNA" (Schönfeld, 2006, p. 55; see pp. 56-57 for additional contrasts with the paradigmatic western theology). In another place, Schönfeld further argues that the *Universal Natural History* advances a theory of immanent teleology, for both the purpose of nature and the means by which it is achieved are inherent in nature itself: the *telos* of nature is the perfection of nature itself and the means are the efficient causation of natural processes (Schönfeld, 2000, pp. 106-11, 126). Stephen Toulmin and June Goodfield similarly note that "[t]hrough Kant's religious piety is unquestionable, yet his cosmology flouted the chronology of the Bible openly and completely" (1965, p. 133).

religion. But, again, his success in this regard is questionable.¹⁶⁶ One can discern a similar tendency in Kant's treatment of man in the *Universal Natural History*. As Polonoff notes, Kant "wishes to say that man is more than a machine. Nevertheless, in keeping with the type of theory Kant has been developing man appears primarily as a mechanism keyed to a characteristic tempo, receiving and coordinating information."¹⁶⁷

In conclusion, the *Universal Natural History* embraces the general point of view of the mathematical approach and offers a cosmological theory which purports to mechanically account for the formation and structure of the planetary system and, on a larger scale, of the entire universe. The central thesis of this theory is that the laws and forces of nature are necessary and immanent in the matter of the world. An important implication of this thesis is that organized systems in the universe evolve and lapse into disorder in an endless cycle so that the universe has no beginning in time.

4.1.3 A Remark on the "Newtonianism" of the *Universal Natural History*

Commentators have suggested that Kant's "Newtonianism" in the *Universal Natural History* surpasses Newton's Newtonianism, since Kant uses purely Newtonian principles and forces to explain not only the current structure of the solar system as Newton did in the *Principia*, but also the structure and mechanical evolution of the entire universe. Lewis White Beck argues that in the *Universal Natural History* Kant "out-Newtoned Newton. Using only Newtonian forces and laws, he provided a plausible theory of the origin and stability of the solar system." Similarly, David

¹⁶⁶ As Helge Kragh remarks, "[a]lthough Kant referred frequently to God and presented his theory as theistic, in reality it was naturalistic, and the references to the Creator largely rhetorical" (2004, p. 12). See also Kragh, 2007, p. 79.

¹⁶⁷ Polonoff, 1973, p. 132, and cf. Schönfeld, 2000, pp. 117-19.

Walford and Ralf Meerbote claim that Kant “out-Newtoned Newton by offering a purely mechanical account of the structure and motions of the universe.”¹⁶⁸ It seems to me, however, that these claims stand in need of modification. Although Kant argues from the perspective of the mathematical approach to nature (i.e. a scientifically oriented attitude which employs mechanical explanations in terms of matter, motion, and forces), the *Universal Natural History* is not strictly Newtonian for several reasons.

First, Kant’s cosmology makes use of a force of repulsion which has no function in the Newtonian physics elaborated in the *Principia*. Although Kant maintains that he has borrowed both attractive and repulsive forces from Newton’s natural philosophy, he acknowledges that whereas the former “is now a law of nature set beyond doubt,” the latter, “to which the natural science of Newton cannot secure so much evidence as to the former, [is assumed] here only in that understanding which is denied by nobody, namely, in connection with the finest dissolution of matter, as for example in vapours” (UNH 1:234-35, J 91).¹⁶⁹ Kant probably encountered the concept of repulsive force in Newton’s speculative conjectures in the *Queries* of the *Opticks*.¹⁷⁰ Yet the crucial role Kant assigned to this force in his theory, which appears nowhere in Newton’s mathematical physics, has led commentators to doubt whether it is truly Newtonian and to speculate as to its genuine origin.¹⁷¹ In general,

¹⁶⁸ Beck, 1969, p. 431; Walford and Meerbote, 1992, p. xxxv. See also de Vleeschauwer, 1962, p. 20.

¹⁶⁹ See also UNH 1:265, J 115.

¹⁷⁰ Boscovich, who also elaborated a dynamical model of matter based on attractive and repulsive forces, confirms that he has found the idea of repulsive force in the *Queries* of Newton’s *Opticks* (*Theory of Natural Philosophy* §2).

¹⁷¹ William Shea speculates that repulsive force finds its way into Kant’s cosmogony via his studies of the ancient atomists as portrayed in Lucretius. The atomists’ incidental *clinamen*, or deviation from falling in a straight line, became, for Kant, the result of the operation of a repulsive force inherent in matter (Shea, 1986, pp. 115-18). Stanley Jaki, the translator of the *Universal Natural History*, comments that repulsive force is “a rather mysterious and most questionable entity” (J 258, note 22). However, he is willing to admit, in agreement with Schönfeld, that Kant could find the inspiration for a repulsive force in the *Queries* of Newton’s *Opticks*. Schönfeld cites other drafts and unpublished

the forces Kant uses in his cosmology are generic powers that cause matter to move toward or away from a certain point, and need not be taken as specifically Newtonian. This is clear in the case of repulsion, and it is also true of attraction. Attraction in Kant's theory is devoid of the specific quantitative characterization Newton gave it in the *Principia*.¹⁷²

More significantly, unlike Newton's *Principia*, the *Universal Natural History* is not a rigorously scientific text. The *Principia* is organized in a geometrical form of definitions, axioms, and theorems, following the example of Euclid's *Elements*. Newton attempts to proceed carefully on the basis of mathematical demonstrations and empirical data. Newton firmly rejects hypotheses and refrains from speculating on things which cannot be "deduced from phenomena."¹⁷³ He wishes to *prove* his claims regarding the planetary system, not just present them as probable. He accordingly declares at the end of the book that he has proved "that gravity really exists."¹⁷⁴ Kant's *Universal Natural History*, on the other hand, is a speculative, qualitative work in natural philosophy, employing inferences from analogies as its main method of

materials in which Newton speaks of repulsive forces (J 252, note 42; Schönfeld, 2000, pp. 112-113. And see *Opticks*, pp. 387-88, 395-96. For further discussions of repulsive forces in Newton and his followers, see Hall, 1963, pp. 363-66; Hall and Hall, 1960; Heimann and McGuire, 1971; Edwards, 2000, pp. 101-03). Jaki further charges that Kant's repulsive force is not only mysterious and questionable, but also "wholly unnecessary," and that Kant "makes it unwittingly clear that his cosmogony rests, in addition to attractive force, not on repulsive force, but on resistance caused by collisions" (J 258-59, notes 22, 31). Kant does in fact offer such an exposition of his system in the *Only Possible Argument*. Here, the only force Kant claims to presuppose is Newtonian universal attraction (OPA 2.7, 2:139) and, in line with Jaki's approach, he argues that lateral motions are the product of "the resistance offered by the colliding particles" (OPA 2.7.3, 2:146). In any case, as Schönfeld explains, repulsive forces are in fact necessary, because they allow "colliding particles to bounce back instead of being mashed together" (Schönfeld, 2000, p. 113), and without bouncing back after collisions there would be no lateral motions.

¹⁷² Moreover, we have seen that Kant construes attraction at a crucial step in the evolution of the celestial bodies as simple cohesiveness of elements of matter and not as Newtonian gravitation, for the latter is too weak and slow in its operation.

¹⁷³ For example, Newton claims in Definition 8 that the concept of force he uses "is purely mathematical, for I am not now considering the physical causes and sites of forces" (*Principia*, p. 407; cf. *Opticks*, pp. 401-02). In other words, he deals only with the quantitative aspects of forces which can be mathematically demonstrated or empirically measured, and not with speculations on the physical mechanism by which they operate.

¹⁷⁴ *Principia*, p. 943

reasoning. Kant concludes his preface to the book with the following remark regarding the validity of his work.

May I be allowed finally to give a brief clarification concerning the validity and the presumed value of those propositions which will come along in the following theory and which I wish to be tested by equitable judges. One judges fairly the author according to the stamp which he impresses upon his wares; therefore I hope that in the various parts of this essay no stricter accountability will be made of my opinion than [the one] conforming to the specification of value which I myself give them. In general, the greatest geometrical precision and mathematical infallibility can never be demanded from an essay of this sort. When the system is based on analogies and correspondences, according to the rules of credibility and correct reasoning, then it has satisfied all the demands of its objective (UNH 1:235, J 91-92).

Kant goes on to rank the plausibility of the various parts of his work. He openly admits that some parts are less probable than others, especially those places in which he was “captivated by the fruitfulness of the system” and advanced “with a certain boldness” and with the help of “the imaginative power.” In these parts in particular, he wishes not to be judged “according to the greatest mathematical rigor which anyhow in this kind of considerations cannot be had,” but instead hopes that “one will grant so much consideration to the stirring agreeableness of the topic and to the pleasure which one has in seeing the harmonies of a theory in its greatest extent” (UNH 1:235, J 92).¹⁷⁵

¹⁷⁵ One must keep this remark in mind when evaluating the *Universal Natural History*. Bearing this in mind may lead one to see that the *Universal Natural History* “was a remarkably successful exercise in speculative cosmology” (Jones, 1971, p. 33). Kant’s two translators into English, William Hastie and Stanley Jaki, represent diametrically opposed views concerning the merit of the work and Kant’s scientific skill. Hastie thinks very highly of Kant’s scientific skills. He praises Kant’s “genuine scientific capacity and achievement” (H xii) and considers him a “thorough scientist” capable of readily “appropriating all the mathematical and physical science of his age” (H xvi-xvii). He even lamented Kant’s drawing away from his “fundamental positions of his early scientific work” in order to elaborate the critical philosophy (H cvii-cix). On Jaki’s account, on the other hand, Kant’s

Thus, by Kant's own admission, the *Universal Natural History* is not Newtonian in the strict sense. Kant does not advance by carefully employing the mathematical principles of Newtonian physics, nor does he provide an adequate observational basis for his cosmological speculations. Indeed, by proceeding qualitatively on the basis of analogies (together with certain metaphysical principles such as the Leibnizian principles of continuity and plenitude), Kant's theory resembles Descartes's cosmogony more closely than it does Newton's *Principia*.¹⁷⁶ The theory Kant proposes in the *Universal Natural History* is in accordance with Newtonian principles insofar as Kant analyzes the formation of the universe in terms of motions of matter due to generic motive forces.¹⁷⁷ In other words, Kant aligns his theory with the general point of view of the mathematical approach to nature, which centers on mechanical explanations in terms of matter and motion.

cosmological propositions fall into three classes: those that lack any scientific merit or relevance; those that do have some scientific merit or relevance, but are unoriginal; and those whose scientific merit or relevance is merely the product of a happy guess, since "[t]enacious amateurism was not to be denied a lucky guess or two even in Kant's case" (J 8). Jaki mocks Kant's scientific abilities and appears eager to embrace Russell's "evaluation of Kant as a mere muddle in the history of philosophy" (J 7). Stephen Palmquist criticizes both assessments of Kant's translators for wrongly assuming that Kant was trying to write a rigorously scientific text. He rejects the bogus image of "Kant the scientist," which was created by his commentators and critics, but never encouraged by Kant himself (Palmquist, 1987, pp. 257-58, 268). Polonoff (1973, pp. 115-21) and Shea (1986) present more balanced evaluations of the *Universal Natural History*. Both writers point to the achievements and shortcomings of Kant's cosmology. Schönfeld also indicates both the flaws and the correct insights of Kant's theory and offers a favorable appraisal overall (Schönfeld, 2000, pp. 113-17, 125-27; and 2006). In contrast to Jaki, he views Kant's correct conjectures as the product of "an educated guess" and contends that the fact that "Kant was able to anticipate future discoveries was not just luck and coincidence. The systematic temporal and spatial extension of the celestial mechanics into a cosmogonical cosmology put him on the right track" (Schönfeld, 2000, pp. 116, 125-26). He also approvingly cites contemporary cosmologists and astrophysicists holding Kant's theory in high esteem and claiming that it constitutes "the essence of modern models" (Schönfeld, 2006, p. 47). In a similar fashion, a recent *Encyclopedia of Cosmology* argues that "Kant provided us the first model of a scientific, albeit highly speculative, cosmology" and that despite its shortcomings this model still "remains a touchstone of contemporary cosmological discussion" (Brittan, 1993, pp. 335, 343). For further discussions and assessments of Kant's theory by recent cosmologists and historians of science and astronomy, see Crowe, 1986, pp. 47-55; Harrison, 2000, pp. 62, 66-71, and 2003, pp. 107-08; Hockey, 2007, pp. 610-11; Kragh, 2007, pp. 78-81. Although critical, these assessments are not unsympathetic to Kant's cosmology.

¹⁷⁶ See Jones, 1971; Polonoff, 1973, pp. 115-17; J 11-12; Shea, 1986, pp. 115-19; Crowe, 1986, pp. 50-51; North, 1994, p. 406.

¹⁷⁷ Naturally, Kant's views in the *Universal natural History* also accord with Newton's theory to the extent that the final organization of the solar system at which Kant's cosmology arrives is congruous with the general Newtonian picture of a system of six planets with ten moons revolving around the sun in coplanar ellipses of very small eccentricity and highly eccentric comets orbiting the sun.

Kant thus loosens Newton's strict standards to some extent. This allows him to accomplish the goal he set for himself, that is, to show that the order of the solar system described in Newton's *Principia*, and by analogy the order of the entire universe, were brought about naturally and mechanically. This challenges Newton's claim that the order of the solar system could not have evolved naturally, but had to be directly imposed by God. In the General Scholium to his *Principia*, Newton maintains that the laws of gravity, by which the celestial bodies are maintained in their orbits, could not have originally placed them in their positions and brought about the order they exhibit.¹⁷⁸ In the *Opticks*, he further suggests that it is "unphilosophical" to seek an alternative explanation for the origin of the world other than God's creation.¹⁷⁹ Kant speculates that Newton resorts to explaining the origin of the world by way of divine creation because he could not find any natural cause of the order found in the solar system within the empty spaces in which the system expands. Kant maintains that this problem "is so significant and valid that Newton, who had reason to trust the insights of his philosophy as much as any other mortal, saw himself necessitated to give up all hope here to explain through the laws of nature and the

¹⁷⁸ *Principia*, p. 940.

¹⁷⁹ In Query 31 of the *Opticks*, after discussing the nature of the primitive particles of matter and the laws of nature, Newton considers God's creation by forming bodies from the primitive particles with the help of the laws of nature. He then claims: "if [God] did so, it's unphilosophical to seek for any other origin of the world, or to pretend that it might arise out of a chaos by the mere laws of nature; though being once formed, it may continue by those laws for many ages. For while comets move in very excentrick orbs in all manner of positions, blind fate could never make all the planets move one and the same way in orbs concentrick, some inconsiderable irregularities excepted, which may have risen from the mutual actions of comets and planets upon one another, and which will be apt to increase, till this system wants a reformation. Such a wonderful uniformity in the planetary system must be allowed the effect of choice" (*Opticks*, p. 402). Newton incorporates similar views into his four letters to Richard Bentley. Before publishing his Boyle Lectures on the "Confutation of Atheism" on the basis of the Newtonian physics, Bentley wrote to Newton for clarifications. Delighted by such a use of his theory, Newton heartily complied. He explained to Bentley that "the motions which the planets now have could not spring from any natural cause alone, but were impressed by an intelligent agent," and reassured him time and again that the "hypothesis of deriving the frame of the world by mechanical principles from matter evenly spread through the heavens [is] inconsistent with [his own] system" (Newton, 1958, pp. 284, 310).

forces of matter” (UNH 1:338, J 174).¹⁸⁰ Nevertheless, Kant believes that Newton’s recourse to God “was a step too large to be contained within the limits of philosophy” (OPA 2.7.3, 2:144), and that a natural, mechanical explanation must be sought. Again, Kant was able to present such an explanation by loosening Newton’s strict standards.

4.2 The Beginning of the World in *New Elucidation*

In *New Elucidation*, Kant considers the world from the perspective of the metaphysical approach. Kant aims to elucidate and establish the fundamental principles of metaphysical cognition. Commentators have accordingly noted that the “*Nova dilucidatio* represents the high noon of Kant’s early rationalism, the very antithesis of his later critical doctrines” and that in “the *Nova Dilucidatio* Kant closely follows the rationalistic tradition.”¹⁸¹ In particular, in *New Elucidation*, Kant examines the characteristics of the substances that constitute the world and the nature and ground of their relations. Whereas in the *Universal Natural History*, Kant analyzes the world in terms of matter and motion and implies that it mechanically evolves in an endless cycle with no beginning, in *New Elucidation*, he treats the world as a system of substances and, as we shall presently see, concludes the opposite, namely, that the world began in an act of divine creation.

After providing his version of the accepted principles of identity and sufficient reason in the first two sections of the treatise,¹⁸² in the third section Kant presents two

¹⁸⁰ See also UNH 1:262, J 113. For an interesting analysis of Newton’s reasons for not developing “Newtonian cosmology” and Kant’s answers to them, see Brittan, 1993, pp. 338-39.

¹⁸¹ Beiser, 1992, p. 35; England, 1929, p. 63. See also Buchdahl, 1969, p. 472. Schönfeld further indicates that the Kant of the *New Elucidation* was one of many Wolffian and rationalistic philosophers who searched for the “first principles” of metaphysics (2000, pp. 131-32).

¹⁸² On Kant’s account, the principle of identity is not identified with the principle of contradiction. Kant rather suggests that the “twin principle” of identity incorporates the first principle of affirmative truths which asserts “whatever is, is,” and the principle of negative truths which asserts that “whatever is not,

original metaphysical principles concerning the nature of substances and the ground of the relations between them: the principle of succession and the principle of co-existence. According to the first, substances can only undergo changes if they interact.¹⁸³ According to the latter, substances do not interact “in virtue of their existence alone,” but because God set them in interacting relationships.¹⁸⁴

The key idea in Kant’s line of argument is that substances are self-sufficient or independent entities. Apart from being created by God, a substance need not be dependent on anything else for its existence. A substance can exist and be completely understood independently of any relation to other substances. Conversely, relations among substances cannot be understood by considering the character of substances, since these relations are not contained in the essences of substances. That is to say, the relations among substances are contingent, not necessary. Therefore, relations among created substances, if there are any, must be imposed externally.¹⁸⁵

is not” (proposition 2). He then argues for the priority of this principle over the principle of contradiction (according to which “it is impossible that the same thing should simultaneously be and not be”) in the hierarchy of truths (proposition 3). Kant’s surrogate for the principle of sufficient reason is the principle of determining ground. This principle applies both to the realm of truths and to the realm of existence. In the former case, the principle entails that for every true proposition there is a ground which establishes the identity of the subject and the predicate (proposition 5). In the latter case, the claim is that for every contingent thing (i.e. everything except God) there is a ground which determines its existence antecedently (proposition 8). For a more detailed discussion of the first two sections of *New Elucidation*, see Reuscher, 1977.

¹⁸³ The principle of succession asserts that “no change can happen to substances except in so far as they are connected with other substances; their reciprocal dependency on each other determines their reciprocal changes of state.” Kant deals with the principle, its demonstrations, “elucidation” and “applications” in proposition 12 of *New Elucidation* (1:410-12). For discussions and criticisms of Kant’s demonstrations, see Laywine, 1993, pp. 32-33; Langton, 1998, pp. 104-07; Watkins, 2005, pp. 114-25.

¹⁸⁴ According to the principle of co-existence, “finite substances do not, in virtue of their existence alone, stand in a relationship with each other, nor are they linked together by any interaction at all, except in so far as the common principle of their existence, namely the divine understanding, maintains them in a state of harmony in their reciprocal relations.” This principle, its demonstration, “elucidation” and “applications” are the subject of proposition 13 of *New Elucidation* (1:412-16). For detailed discussions of the principle of co-existence, see Laywine, 1993, pp. 37-42; Watkins, 2005, pp. 140-60.

¹⁸⁵ Kant’s position in *New Elucidation* corresponds to Whitehead’s doctrine of imposed law. Whitehead characterizes this doctrine as follows: “The doctrine of Imposed Law adopts the alternative metaphysical doctrine of External Relations between the singular things which are the ultimate constituents of nature. The character of each of these ultimate things is thus conceived as its own private qualification. Such an existent is understandable in complete disconnection from any other such existent: the ultimate truth is that it requires nothing but itself in order to exist. But in fact there is

Accordingly, the metaphysical doctrine of *New Elucidation* implies that it is possible to choose between several sets of laws, and that an agent is required to choose and impose a certain set. This agent is God, the “common cause” of all things. His creation has two aspects: creating the building blocks of the world (i.e. substances) and establishing the relations among them. This means that the world began with a single “indivisible act” of creation which had brought it into existence and constituted once and for all the laws governing its course (NE 1:415). Furthermore, the laws which bring order to the world are completely subjected to God’s free will. He could impose other sets of laws of interrelations between substances or prevent interactions from occurring within the universe altogether. The actual laws of nature are thus *transcendent* and *contingent*. Note the voluntaristic tone in the following passage.

...since the reciprocal connection of substances requires that there should be, in the effective representation of the divine intellect, a scheme conceived in terms of relations, and since *this representation is entirely a matter of choice for God, and can therefore be admitted or omitted according to His pleasure*, it follows that substances can exist in accordance with the law which specifies that *they are in no place* and that they stand in no relation at all in respect of the things of our universe (NE 1:414, my italics at “this representation...pleasure”).

In sum, Kant argues in *New Elucidation* from the standpoint of the metaphysical approach to nature. The self-sufficiency or independence of the ultimate building blocks of the world is a fundamental tenet of this approach. This tenet entails that

imposed on each such existent the necessity of entering into relationships with the other ultimate constituents of nature. These imposed behaviour patterns are the Laws of Nature” (Whitehead, 1933, p. 144). Whitehead considers the doctrine of imposed law a “Cartesian doctrine”: “The doctrine of Imposition very naturally follows from Descartes’ notion of ‘substance’. Indeed the phrase ‘requiring nothing but itself in order to exist’ occurs in his *Principles of Philosophy*” (Whitehead, 1933, p. 145). It is clear that this doctrine is no less applicable to Kant’s position in *New Elucidation*.

relations between natural things are not necessary and calls for a special act of divine imposition of the laws of interactions.¹⁸⁶ This brings the positions of the two major texts of 1755, the *Universal Natural History* and *New Elucidation*, into conflict with one another. While the former implies a deterministic view of a naturally evolving universe in an endless cycle with no beginning in time, the latter advances a voluntaristic conception of a world freely formed and created by God at some point in time.

4.3 A Reconciliation between the Approaches in the *Only Possible Argument*

In *The Only Possible Argument in Support of a Demonstration of the Existence of God* of 1763, Kant considers various arguments for the existence of God. He does not deal directly with the question of the extent of the world, but two of its central distinctions, namely that between necessary and contingent orders of nature and that between moral and non-moral dependence on God, may be taken as an attempt to reconcile the conflicting necessitarian and voluntaristic approaches of the *Universal Natural History* and *New Elucidation* with regard to the problem of the beginning of

¹⁸⁶ This is, at least, the metaphysical picture of the third and last section of the work. As F. E. England shows, one can find in *New Elucidation* two different lines of argument for the existence of God, namely, an argument from possibility in general and an argument from the contingent existence of created things. Each argument involves a different conception of God and his relation to the world. The first advances a necessitarian, immanent notion of God as the ground and the world as a consequence (which is in line with the theory of the *Universal Natural History* and anticipates the *a priori* argument of the *Only Possible Argument*), whereas the second suggests a voluntaristic, transcendent notion of God as the cause and creator and the world as his product (England, 1929, pp. 53-62). I take it that the overall, general metaphysical position of the last section of *New Elucidation*, which incorporates the voluntaristic thesis and in which Kant's two original metaphysical principles are introduced, is the ultimate picture Kant *desired* to depict. This position is largely in agreement with the metaphysical view of a world of interacting created substances put forth in *Living Forces* and the *Physical Monadology*. Whether or not Kant succeeds in establishing the truth of this position, and whether or not it is in agreement with views advanced in earlier sections of the work, are quite different issues.

the world. These distinctions appear in the second section of the work.¹⁸⁷ In the first part of the present section, I consider these two distinctions and explain how they constitute a reconciliation between the conflicting accounts of the world presented in the *Universal Natural History* and *New Elucidation*. In the second part, I argue that despite the fact that the official view of the *Only Possible Argument* is that the world was created by a free divine choice, the actual doctrine of the work, emerging from the distinctions between two types of natural orders and dependencies on God, suggests a more complex, Platonist position. That is, it implies that the matter of the world and the necessary order that derives from the laws of matter are eternal, while a higher type of order was established by God in a certain point in time.

4.3.1 The distinctions between types of natural orders and dependencies on God

In the first part of the second section of the *Only Possible Argument*, Kant introduces a distinction between two types of order in nature. The two differ with respect to their grounds. On the one hand, a natural order or regularity can be the product of choice and deliberate institution. This type of order is a *contingent* order of nature.

If we discover an arrangement in nature, which seems to have been instituted for a special purpose, since the general properties of matter on their own could not have produced such an order, then we regard this provision as contingent and as the product of choice. Now, if new harmony, order and usefulness should make their appearance, along with mediating causes

¹⁸⁷ The *Only Possible Argument* consists of three parts. In section 1, Kant reiterates and further elaborates the *New Elucidation's a priori* argument from possibility (See note 194 below). In this argument, Kant famously denies that existence is a predicate, thereby repudiating the cornerstone of the Cartesian ontological argument. In section 2, Kant examines *a posteriori* proofs for the existence of God. Here, Kant criticizes the “usual method of physico-theology” and offers a revised method in its place. In section 3, Kant concludes the text by succinctly evaluating the four types of arguments for the existence of God. Kant rejects the Cartesian ontological argument and the Leibnizian-Wolffian argument from the contingent existence of the world, and instead offers his own *a priori* argument from possibility and a revised physico-theological (or cosmological) argument.

especially instituted to produce these effects, then we judge them in the same way to be contingent and the product of choice. This connection is quite alien to the nature of the things themselves. They stand in this harmonious relation simply because someone has chosen to connect them in this way. No general cause can be adduced to explain the sheathed character, that is to say, the retractability of the claws of the cat, the lion, and so on. The only explanation which can be given is that a Creator has ordered them in this way, with a view to protecting them from wear, for these animals must have implements suitable for seizing and retaining their prey (OPA 2.1.2, 2:96).

On the other hand, a natural order can be a consequence of the general properties of matter or of the essences of natural things. This type of order is a *necessary* order of nature.

But suppose that matter has certain properties of a more general character, which, in addition to producing certain benefits which may be construed as their *raison d'être*, are also particularly suited to producing even more harmony, and doing so without the least provision being made to bring it about. Suppose that a simple law, which is universally agreed to be necessary for the production of a certain good, also produces fruitful effects in many other ways as well. Suppose that that simple law was the source of further usefulness and harmoniousness, not by art, but rather of necessity. And suppose, finally, that this should hold throughout the whole of material nature. If all this were supposed, then there would obviously inhere in the very essence of things themselves universal relations to unity and cohesiveness, and a universal harmony would extend throughout the realm of possibility itself. Such a state of affairs would fill us with admiration for such extensive adaptedness and natural harmony. Adaptedness and natural harmony such as this, although rendering punctilious and forced art superfluous, can nonetheless never themselves be ascribed to chance. It rather indicates that there is a unity to be found in the possibilities of things themselves; it suggests that the essences of all things are without exception dependent upon one single great ground (OPA 2.1.2, 2:96-97).

The notion of a necessary order of nature accords with the general view presented in the *Universal Natural History*. Following a line of thought similar to the one found in the *Universal Natural History*, Kant aims to show that the order and unity exhibited in natural phenomena need not be ascribed to intentional design, but can rather be consequences of the essences of natural things. Most importantly, the laws of motion derive from the essences of things and, therefore, belong to the necessary order of nature.¹⁸⁸ Furthermore, although the necessary order of nature is not a product of God's wise choice, Kant, following again his position in the *Universal Natural History*, rejects the possibility that this type of order could result from mere chance. On the contrary, the necessary order of nature implies "that the essences of all things are without exception dependent upon one single great ground" (OPA 2.1.2, 2:97).¹⁸⁹

Finally, as in the *Universal Natural History* Kant here employs the same example of the behavior of winds in tropical coasts in order to illustrate the point that explanations of occurrences of order and regularity in nature need not appeal to an underlying intentional design. Assume for the sake of argument that the existence of the atmosphere and air is ultimately explained by the fact that they serve the purpose of enabling living creatures to respire. Even granting this, this particular character of

¹⁸⁸ Kant claims in the *Only Possible Argument* that the laws of motion are "such that matter cannot be thought independently of them" and that "the necessity of these laws is such that they can be derived from the universal and essential constitution of all matter without the least experiment and with the greatest distinctness" (OPA 2.1.2, 2:99). His view on the status of the laws of motion is thus diametrically opposed to that of Leibniz: "The supreme wisdom of God has made him choose especially those *laws of motion* which are best adjusted and most fitted to abstract or metaphysical reasons. There is conserved the same quantity of total and absolute force or of action, also the same quantity of relative force or of reaction, and finally, the same quantity of directive force. Furthermore, action is always equal to reaction, and the entire effect is always equal to its full cause. It is surprising that no reason can be given for the laws of motion which have been discovered in our own time, and part of which I myself have discovered, by a consideration of *efficient causes* or of matter alone. For I have found that we must have recourse to *final causes* and that these laws do not depend upon the *principle of necessity*, as do the truths of logic, arithmetic, and geometry, but upon the *principle of fitness*, that is to say, upon the choice of wisdom. This is one of the most effective and obvious proofs of the existence of God for those who can probe into these matters thoroughly" (*Principles of Nature and of Grace* §11, L 639-40).

¹⁸⁹ See also OPA 2.1.1, 2:96. As we will see, here too one cannot consider a divine creator in the traditional sense to be the ground of the necessary order of nature.

the atmosphere has other effects, such as the behavior of winds in tropical coasts, which need not be explained by a further appeal to their supposed usefulness. Tropical coasts enjoy cooler sea-winds during the hottest hours of the day, whereas at nights the wind blows in the opposite direction, namely, from the land to the sea. This desirable arrangement makes life more tolerable in these overheated regions. But the desirability and usefulness of this phenomenon should not be used to explain its existence since, regardless of whether or not living beings inhabit these areas, this phenomenon occurs mechanically because of the physical properties of the air and the laws of physics. During the daytime, the land heats up more quickly than the sea. Consequently, the air above the heated ground expands and decreases in density. Hence, it is driven out by the denser air above the cooler sea. At night, the land cools down faster than the sea, so that wind in the opposite direction results in a similar way. Thus, an intentional design is not needed to regulate the wind behavior in these places, and one need not appeal to such a design in order to explain this phenomenon.¹⁹⁰

The example of the atmosphere indicates how natural laws can generate order and regularity in nature. In the *Only Possible Argument*, Kant follows the lead of the *Universal Natural History* by considering this type of order in nature a necessary consequence of the general properties of matter. The notion of a contingent order of nature, however, challenges the general position of the *Universal Natural History*. We have seen that in the latter text, Kant purports to account for the entire universe mechanically. Kant focuses his account on material things, but there are strong indications that the mechanical account extends to all kind of things, including immaterial things. Thus, in the *Universal Natural History*, Kant seems to suggest that

¹⁹⁰ See OPA 2.1.2, 2:97-98 and cf. UNH 1:223-25, J 83-84. See also *Theory of Winds*, 1:492-94.

everything in nature happens and evolves necessarily and mechanically.¹⁹¹ By contrast, in the *Only Possible Argument*, Kant contends that not all natural arrangements are simply necessary consequences of the essences of things. In this work, Kant distinguishes two distinct structures or orders in nature. Some, but not all, objects evolve mechanically and in accordance with physical laws of nature. Others are not entirely dependent on the essence and general properties of matter. That is to say, these properties, together with the initial, chaotic distribution of matter, are not sufficient to bring these objects into existence. They rather had to be brought about intentionally by God, which means that they are part of the contingent order of nature. The contingent aspects of phenomena have a fundamentally different causal structure, and they are not reducible to mechanical processes. Therefore, it is in vain to hope for a mechanical explanation in their case. To use Kant's example, the structure of the claws of the Felidae cannot be mechanically explained by means of the essence of matter and the laws of motion alone.¹⁹² It is indeed noteworthy that in the summary of the cosmogony in the *Only Possible Argument*, Kant omits the mechanical explanation of organic and rational life with which he concludes the *Universal Natural History*.

¹⁹¹ In the third part of the *Universal Natural History*, Kant presents a mechanical explanation of certain aspects of organic nature as well. He tries to link the evolution of life with material conditions, and to explain differences in rational capacities of intelligent creatures by means of differences in their bodily properties and their distance from the sun. He concedes that the organic aspects of nature do not readily lend themselves to human mechanical explanations, but this does not mean they do not evolve mechanically. I consider this point in detail in section 6.1 below.

¹⁹² See: "nature is rich in another kind of production. And here, when philosophy reflects on the way in which this kind of product comes into existence, it finds itself constrained to abandon the path we have just described [i.e. in terms of the necessary order of nature]. There is manifest in this case great art and a contingent combination of factors which has been made by free choice in accordance with certain intentions. Such art and free choice are the ground of a particular law of nature, which itself belongs to an artificial order of nature. The structure of plants and animals displays a constitution of this kind; and it is a constitution which *cannot be explained by appeal to the universal and necessary laws of nature...* it would be *absurd to regard the initial generation of a plant or animal as a mechanical effect incidentally arising from the universal laws of nature*" (OPA 2.4.2, 2:114, italics added).

The notion of contingent order of nature opens the possibility for a voluntaristic divine intervention in nature, in accordance with the general doctrine of *New Elucidation*. Indeed, in the second part of the second section of the *Only Possible Argument*, Kant introduces a distinction between two forms of natural dependence on God,¹⁹³ namely, moral and non-moral. Something's dependence on God is *moral* "when God is the ground of that thing through his *will*" or when its existence can be attributed to the wise choice of God. God's will "makes nothing possible." It rather "merely decides upon what is already presupposed as possible" (OPA 2.2, 2:100, italics added). In other words, God is not free to determine the realm of essences and possibilities. Whatever follows from the essences of things depends only *non-morally* on God. The non-moral dependence of the essences of things on God means that God is the material ground of all possibility, as Kant demonstrates in the ontological argument in the first section of the book.¹⁹⁴ In short, every natural occurrence depends non-morally on God, since its possibility is somehow grounded in God. Additionally, some natural occurrences depend morally on God, since they have been intentionally

¹⁹³ Kant introduces a further distinction between natural and non-natural (or supernatural) dependence on God. Things or events can depend on God either through the mediation of the order of nature (be it the necessary or the contingent order of nature), or independently of that order. The former are natural things and events; the latter are supernatural. Natural events take place by the forces of nature and in accordance with the general laws of nature. Supernatural events intervene in and break the causal chains in the order of nature. See OPA 2.3.1, 2:103-05.

¹⁹⁴ Kant's ontological or *a priori* proofs in *New Elucidation* (1:394-96) and the *Only Possible Argument* (2:70-92) are essentially the same (Kant also presents a concise version of the proof in the *Inquiry*, 2:296-97). At the heart of the proofs is an analysis of the notion of possibility. Possibility turns on a comparison between concepts and demands both that "something which is thought" (i.e. data or contents) will be given and that there will be no "logical opposition" (i.e. contradiction) between the compared contents. There are, therefore, two essential conditions of possibility, namely, material or real on the one hand, and formal or logical on the other. Possibility is eliminated if there is a contradiction or if materials for thought are absent: "in every comparison the things which are to be compared must be available for comparison, and where nothing at all is given there is no room for either comparison or, corresponding to it, for the concept of possibility" (NE 1:395). Possibility thus presupposes something actual, namely, a certain reality which grounds the material element of possibility or through which the "real" in every possible concept is given. Kant tries to show next that that actuality is a necessary being, that there is only one such being, and that it is infinite and simple. God, according to this argument, is the necessary condition not only of existence, but also of all possibility. For discussions and critical analyses of Kant's proof from possibility, see England, 1929, pp. 48-56; Wood, 1978, pp. 64-79; Treash, 1979, pp. 9-27; Fisher and Watkins, 1998, pp. 371-80; Adams, 2000; Schönfeld, 2000, pp. 197-208; Grier, 2001, pp. 22-25.

instituted by God. This, again, enables Kant to stress that his view does not permit order to arise accidentally.¹⁹⁵

The distinction between moral and non-moral dependence is clearly linked to the former distinction between contingent and necessary natural orders. On the one hand, the contingent order of nature is morally dependent on God, since it is a product of God's choice. On the other hand, the necessary order of nature depends non-morally on God, since it is a consequence of the essences of things, which, in turn, depend on God as their material condition. Kant emphasizes that this type of order does not depend on God's choice and that the unity it exhibits is "derived from a Wise Being, but not through His wisdom" (OPA 2.5.2, 2:119).¹⁹⁶

Kant's development of these distinctions may be taken as an attempt to do justice to both the necessitarian view of the *Universal Natural History* and the voluntaristic approach of *New Elucidation*. While Kant stresses the fact that a large portion of the order in nature follows necessarily from the essences of natural things, he explicitly argues that some natural arrangements are direct products of divine free creation. I will now examine the implication of these distinctions for the question of the beginning of the world.

¹⁹⁵ Kant emphasizes that the necessary order of nature, which depends non-morally on God, derives "from that in God which harmonises most fully with His properties in general" and that such a "unity is not... inferred from the wise choice as its cause [but] is rather derived from a ground in the Supreme Being which is such that it must also be a ground of great wisdom in Him" (OPA 2.4.1, 2:110; 2.5.2, 2:119. See also 2.6.3, 2:126). In other words, the necessary order of nature and God's wisdom are not related as consequence and ground. Instead, both depend on the very same ground. Hence, there is no coincidence in the harmony and unity stemming from the necessary order of nature (see the summary of this point in OPA 2.6.2, 2:125-26). Furthermore, Kant suggests in a footnote that God's wisdom depends on the harmony and unity inherent in the essences of things, which, in turn, must be grounded in God in order for him to remain absolutely independent: "Wisdom presupposes that harmony and unity are possible in the relations. That Being which is by nature completely independent can only be wise in so far as it contains the grounds of even the *possible* harmony and perfections which offer themselves for realisation by that Being. If there were no such relation to order and perfection to be found in the possibilities of things, wisdom would be a chimaera. But if this possibility were not in itself grounded in the Wise Being, then this wisdom could no longer be independent in every respect" (OPA 2.6.2, 2:125-26).

¹⁹⁶ See also OPA 2.2, 2:103.

4.3.2 The distinctions and the problem of the beginning of the world

Kant's official position in the *Only Possible Argument* with respect to the beginning of the world is similar to that of *New Elucidation*. He maintains that the world is a product of the free will and wisdom of God, thereby implying that the world has a beginning in time. I argue, however, that the actual doctrine of this work, derived specifically from the distinctions discussed above, suggests an intermediary path between the necessitarian and the voluntaristic approaches to this question.

Kant contends that the existence of things and nature as a whole depends morally on God: "this dependency is always moral; in other words, things exist because God *willed* that they should exist" (OPA 2.2, 2:100). Kant simply states, without justification, that the existence of the world morally depends on God. Significantly, this claim does not follow from the general doctrine of the *Only Possible Argument*. On the contrary, the general line of argument in this work seems to accord more naturally with an alternative, Platonic thesis, according to which the material world and its necessary consequences exist eternally, while other, contingent aspects of the world were instituted at some point in time by a divine architect. If laws of motion are "such that matter cannot be thought independently of them," and if they are logically derived from "the universal and essential constitution of all matter" (OPA 2.1.2, 2:99), then it is reasonable to conclude, in the same fashion as in the *Universal Natural History*, that matter and its laws are necessary consequences of the divine existence. And, since what follows necessarily from the necessary being cannot fail to obtain, matter and its consequences are temporally coextensive with God and, therefore, have no first beginning in time.

This view is also supported by the fact that Kant holds considerations of the necessary order of nature in high esteem. In the context of the arguments for the

existence of God, Kant particularly favors proofs that set out from the necessary order of nature over those based on the contingent order. First, he argues that the ordinary physico-theological proof, which is based on the contingent order of nature, is not sufficiently “philosophical,” and that one should base one’s explanations of nature on considerations of the necessary order of nature as much as possible.¹⁹⁷ Secondly, while the traditional physico-theological proof from the contingent order of nature can at most show that there is an agent who orders the matter of the world, the necessary order of nature reveals the complete dependence of the world on God. This means that both the matter (i.e. the existence of the things which compose the world) and the order or form (i.e. the laws governing the relations of things) of the world is dependent on God.¹⁹⁸ Thus, Kant’s revision of the physico-theological argument

¹⁹⁷ Supporters of the ordinary physico-theological proof tend to explain every regularity and useful feature of nature in terms of the immediate intention of God. They believe either that the laws of nature cannot produce order by themselves or that acknowledging the ability of laws of nature to issue order is equivalent to ascribing the perfection of nature to blind chance. Kant dismisses both assumptions as prejudices, which makes them “all the more dangerous for furnishing the lazy with an advantage over the tireless enquirer; it does so under the pretext of piety and of just subjection to the great Author.” Kant expresses particular disdain for the tendency to interpret natural forces as being directed toward achieving certain individual effects which are considered useful (e.g. the shaping of the specific form of a particular mountain or river) and the appeal to moral grounds in the explanation of such phenomena. Both impede the extension of philosophical understanding of nature, which is to be based as much as possible on physical causes and general laws (OPA 2.5.2, 2:119-22. See also his summary of the five degrees of philosophical modes of explanation of order in nature in OPA 2.6.4, 2:134-37). It is therefore necessary to attempt to explain phenomena which demonstrate order and regularity by viewing them as parts of the necessary order of nature and as governed by universal natural laws. One should “presume that the necessary unity to be found in nature is greater than strikes the eye” and thus apply this mode of investigation even to cases which may at first seem contingent (OPA 2.6.3, 2:126-27). That is, in explaining the forms of organic phenomena, we may initially proceed by supposing certain intentional designs, but the investigation should be carried on further in order to establish the extent of the necessary unity which may be found in this case as well. Accordingly, Kant approvingly cites Maupertuis, who considers the necessary unity implied in the universal laws of nature a more appropriate ground for a proof of the existence of God than any particular contingent arrangements discernible in nature (OPA 2.1.2, 2:98-99). In contrast to Kant, however, Maupertuis construed laws of motion as contingent. For a discussion of Maupertuis on the contingency of laws of motion and the proofs for the existence of God, see Polonoff, 1973, pp. 92-102, 165-68.

¹⁹⁸ We have seen that the necessary order of nature, which consists in the organized consequences following from the essences of things, depends non-morally on God in the sense that God is the material ground of these essences. Since God is the ground of the essences of things, he is the ground of both the system of relations which is implied in their essences, and their very possibility, and hence, *a fortiori*, their existence. By contrast, the traditional physico-theological proofs from the contingent order of nature can only serve to prove the existence of an *architect* of the world. The notion of God which stems from this proof is that of one who shapes and orders the matter of the world, but this

consists in distinguishing a second type of natural order (i.e. the necessary order) and shifting the focus from the contingent to the necessary order. Kant's emphasis on the necessary order of nature accords both with the requirement of investigating nature philosophically and with the concerns of theology.

The key point is that the matter of the world depends non-morally on God. Insofar as the matter of the world depends non-morally on God, it is not a product of God's free creation, but rather a consequence of God as a necessary being. And again, since that which is a consequence of the necessary being also exists necessarily and eternally, matter and the necessary order of nature are temporally coextensive with God. In short, in line with the Platonic thesis, the ultimate conclusion of Kant's revised physico-theology is that the matter of the world and the necessary order which follows from its essence are coeternal with God, while the contingent order of nature was deliberately instituted by God at some point in time.

4.4 The Analysis of the Problem of the Size of the World in the Dissertation

Prior to the Dissertation, Kant believed that the cosmological question concerning the size of the world could be addressed by metaphysical considerations or by mechanical accounts. He did not take the question itself to be problematic, and in particular, he did not construe it as one which separates the mathematical and metaphysical approaches.¹⁹⁹ We have seen that despite his formal claim that the world has a

notion says nothing at all about the dependence of matter on God. See OPA 2.5.2, 2:122-23; 2.6.2, 2:124-26; 2.6.3, 2:126-27.

¹⁹⁹ In the preface to the *Universal Natural History*, Kant points to the epistemological and theological difficulties in his cosmological enterprise and explains why and how they can be overcome. In any

beginning in time, not all his early doctrines support this view. Indeed, the account of the metaphysical approach, which regards the world as a system of substances, implies the existence of a temporal beginning of the world. But analyzing the world from the perspective of the mathematical approach as a mechanical system in terms of matter and motion suggests the opposite view, namely, that the world exists from eternity. Both accounts turn on an examination of the character of the stuff that makes up the world (self-sufficient substances or matter subjected to mechanical laws) and the ground of the interaction between the constituents of the world (interaction is either imposed on them from without or inherent in their essences). Both accounts contain a discussion of the relation of the world to God. The Dissertation, on the other hand, suggests a more abstract analysis which is centered on a general reflection on the concept of the world and leaves only marginal place for a discussion of the relation of the world to God. In this analysis, Kant considers not only the things composing the world and the relations among them, but also the entirety or wholeness of the system of the world. In a way that anticipates the demand for the totality of conditions in the Antinomy, it is the latter element of entirety that makes the notion of the world problematic, since there are two conflicting requirements concerning the comprehension of the world whole. On the one hand, reason requires one to think of the entire world as finite, while on the other hand, the conditions of sensible cognition require one to represent the world as a whole that expands in infinite time and space. Kant attempts to solve this problem in a manner analogous to the solution of the divisibility problem discussed in chapter 2, namely, by means of the separation doctrine. According to the solution put forth in the Dissertation, the claim of the

case, in the *Universal Natural History* he does not take the question of the size of the world to be one that generates a conflict between the two general approaches.

metaphysical approach concerning the finitude of the world pertains to the intellectual world, while the claim of the mathematical approach concerning the infinitude of the world is supposed to apply to the sensible world. In this section, I examine Kant's analysis of this issue in the Dissertation.

In the first section of the Dissertation, Kant enumerates three essential elements of the definition of a world: matter (substances), form (the coordination of substances), and entirety (the absolute totality of the world's component parts). A world is defined as a complete system of interacting substances, namely, one which is not a part of a more comprehensive system. The requirement of totality poses a problem for the notion of the world. On the one hand, the physical world extends infinitely in space and time. This is so because, as we have seen,²⁰⁰ the physical world is conditioned by space and time, and the latter are continuous and infinite magnitudes.²⁰¹ This means that the series of worldly events or states has no limit. On the other hand, entirety requires that the series be completed.

... when we reflect upon it [i.e. entirety] more deeply, it is seen to present the philosopher with a very serious problem. For it is hardly possible to conceive how the *never to be completed series* of the states of the universe, which succeed one another to *eternity*, can be reduced to a whole, which comprehends absolutely all its changes. Indeed, it necessarily follows from its very infinity that the series has no *limit*. Accordingly, there is no series of successive things except one which is part of another series. It follows that, for this same reason, comprehensive completeness or *absolute totality* seems to have been banished altogether here. For, although the notion of a part could be taken universally, and although all the things which are contained under this notion might constitute a single thing if they were regarded as posited in the same series, yet it seems to be required by the concept of *a whole* that all these things should *be taken*

²⁰⁰ See above, section 2.4.

²⁰¹ See Diss §1, 2:388; §14, 2:399-400; §15, 2:403, note, 2:405; 2:410.

simultaneously. And, in the case given, this is impossible. For since nothing succeeds the whole series, and since, if we posit a series of things in succession, there is nothing which is not followed by something else, except when it is last in the series, there will be something which is last for eternity, and that is absurd (Diss §2, 2:391).

Again, as we have seen in chapter 2, the difficulty arises from the conflation of features of objects of different classes and of requirements of different cognitive faculties. The remedy is to separate these features and requirements, that is, to separate the sensible and intellectual worlds and the sensible and intellectual cognitions. One has to distinguish between two ways of referring to the requirement of absolute totality involved in the notion of the world, namely, either intellectually conceiving it by means of the general concept of composition, or concretely representing it in intuition under the conditions of sensibility.

... it is one thing, given the parts, to conceive for oneself the *composition* of the whole, using an abstract concept of the understanding, and it is another thing to *follow up* this general *concept*, as one might do with some problem of reason, by the sensitive faculty of cognition, that is to say, to represent the same concept to oneself in the concrete by a distinct intuition. The former is done by means of the concept of *composition* in general, in so far as a number of things are contained under it (in reciprocal relations to each other), and thus by means of ideas of the understanding which are universal. The latter case rests upon the *conditions* of time, in so far as it is possible, by the successive addition of part to part, to arrive genetically, that is to say, by SYNTHESIS, at the concept of a compound; this case falls under the laws of *intuition*... But for a compound there must be a *multiplicity* of parts, and for a whole there must be a *totality* of parts... the synthesis will only be completed... and the concept of a *whole* will only emerge by means of synthesis, if the... [process] can be carried out in a finite and specifiable period of time (Diss §1, 2:387-88).

The fact that we cannot represent the series of the world as a totality in intuition does not mean that our notion of the world is incoherent. It rather indicates that we mistakenly try to apply the conditions of sensible intuition to reason. That is, we try to represent the intellectual notions of infinity, composition, and entirety in intuition. Kant maintains that the “thorny question” concerning the infinite series of the world does not belong “to a concept of a whole which derives from the *understanding* but only to the conditions of *sensitive intuition*” (Diss §2, 2:392).²⁰² Reason forms a notion of the intelligible world as a whole simply by means of combining concepts. It only *thinks* of the parts of the world “as constituting a unity” (Diss §2, 2:392), and need not also *represent* them as such. In short, Kant argues that because reason is free from the need to represent the entire series of the states of the world in concrete intuition, it has no difficulty forming a concept of an entire world. This concept, however, applies to the intelligible world, not to the sensible world. Furthermore, this is a concept of a whole which has limits. Kant contends, in a way that anticipates reason’s demand for finality and closure in the Dialectic, that the mind or reason “demands and adopts for itself limits,” that “[a]ccording to the rules of pure understanding... in a series of caused things there is no regress without a limit,” and that reason affirms that “the magnitude of the world is limited” (Diss §1, 2:389; §28, 2:415-16).

The situation with respect to the sensible world is more complex. It seems that the difficulty remains: on the one hand, the general concept of the world stipulates the totality of the world-series, but on the other hand, the series extends infinitely in time and space, and thus has no limit. That is to say, it is still not clear how one can

²⁰² The infinite series of simultaneous things (i.e. the extent of the world in space), which I do not discuss here, generates the same problem.

represent the sensible world of physical objects and events as a whole. Kant does not explicitly resolve this problem. He seems content with the fact that the difficulty is resolved with respect to the intellectual world conceived by reason independently of sensibility.

The problem of conceiving of the infinite physical world as a whole, however, is pressing and still requires a resolution. This problem closely resembles the thesis argument against the infinity of the world. As we will see in the next chapter, the thesis argument turns on the conflict between the requirements of the totality of the world-states, understood as conditions of the present state of the world, and the notion of the never-completed series of world-states. One clear difference between the antithesis and the Dissertation's discussion of the sensible world is that the former concerns only the series of past states and events. We have seen that the notion of the world in the *Critique* is linked to the hypothetical syllogism and that, consequently, reason is interested in the series of past states and events as conditions of the present state of the world, and not in the series of future states or in "whether or not in general the series [of future states] stops."²⁰³ In the Dissertation, on the other hand, the direction of the series has no significance. What emerges as problematic is only the conflict between the requirement of totality and the infinity of the series of the world-states, regardless of its direction.²⁰⁴

²⁰³ See: "Absolute totality is demanded by reason only insofar as reason is concerned with the ascending series of conditions for a given conditioned, hence not when dealing with the descending line of consequences, nor with the aggregate of coordinated conditions for these consequences. For in regard to the given conditioned, conditions are regarded as already presupposed and given along with the conditioned; whereas, since the consequences do not make their conditions possible, but rather presuppose them, in proceeding to the consequences (or in descending from a given condition to the conditioned) one remains untroubled about whether or not in general the series stops, and the question about its totality is not at all a presupposition of reason" (A409-10/B436-37).

²⁰⁴ In fact, in the citation above from the Diss §2, 2:391, Kant refers to the end of the series and not to its beginning. Later in the text, Kant speaks of an infinite successive series, the direction of which is significant (see Diss §28, 2:415). This series, however, is not one of worldly states differentiated

In sum, Kant's discussion of the size of the world in the Dissertation suggests a solution to the problem only for the intelligible world. There is no clear resolution to the difficulty involved in the notion of the physical world as a whole. Although it seems that the separation thesis implies that the physical world is infinite, Kant does not explicitly disentangle the conflict between the opposite requirements involved. This then, together with the general reservations concerning the separation doctrine discussed in chapter 2, calls for reconsideration and further analysis, which we find in the first antinomy.

according to their temporal order, but rather one of events linked by causal connections. This difference reflects the *Critique's* later distinction between world and nature (see above, note 87).

Chapter 5: The First Antinomy

In chapter 3, we found a close connection between the pre-critical and critical analyses of the problem of composition and divisibility. Central principles underlying the earlier treatment of the problem still play an important role in the proofs of the thesis and antithesis of the second antinomy. We have also seen that Kant does not completely reject these principles, but rather considers them from a transcendental point of view and reinterprets them as essential factors of human cognition. By contrast, there is no such close connection between the pre-critical and critical analyses of the problem of the magnitude or size of the world. Although Kant's discussions of the problem in *New Elucidation*, the *Universal Natural History*, and the *Only Possible Argument* may indicate why the metaphysical and the mathematical approaches naturally involve the views that the magnitude of the world is finite and infinite, respectively, there are no traces of these discussions in the proofs of the thesis and antithesis of the first antinomy.

On the other hand, there is a clear link between Kant's analysis of the issue in the Dissertation and the first antinomy. In both cases, Kant turns to more abstract reflections on the notion of the world in general. In particular, Kant carries over the problems of the thought of the sensible world as a whole and of the notion of infinity from the Dissertation to the *Critique*. It is in the Dissertation that Kant explicitly recognizes for the first time that the question of the size of the world poses a problem of principle. We have seen that Kant's attempt to solve this problem constitutes one of the main motives for the separation doctrine of the Dissertation. However, we have also seen that this way of resolving the conflict fails because the subsequent

discussion of the formal thesis in the Dissertation makes it clear that the sensible world is not completely divorced from the intelligible world. As a result, Kant became aware of the fact that his account in the Dissertation was still committed to conflicting claims concerning the size and composition of the empirical world. This situation led him to a critical examination of the way in which we consider objects. I suggested in chapters 2 and 3 that it was to this that Kant referred when he claimed that the antinomy of pure reason had aroused him from his dogmatic slumber.

In the *Critique*, Kant argues that the resolution of the conflict between the metaphysical and the mathematical approaches calls for a radically new understanding of the empirical world. He maintains that such a resolution requires a new distinction between two perspectives from which the world is considered, namely, as an appearance or as a thing in itself. The conflict concerning the size of the world is resolved if the world is taken as an appearance, since the world as an appearance has no determinate size, and therefore need not be finite or infinite. The proposition concerning the beginning of the world in time is instead reinterpreted as an element of our cognitive structure (in particular, as a regulative maxim of the empirical investigation of the world) in Kant's new metaphysics of experience.

The resolution of the first antinomy has important consequences for cosmology in general, and for Kant's own pre-critical and modern cosmologies in particular. Kant concludes that the empirical world as a whole (the "totality of appearances") is not an object for us and that the notion of the world is not an empirical concept, but merely an idea of reason. Hence, the empirical world is not given as an object which is either finite or infinite. Consequently, any attempt to determine the absolute origin and size of the empirical world as a whole is misguided. This does not mean that cosmology is a dubious discipline or pseudoscience. Kant's view merely limits cosmology's

aspirations to account for the absolute origin and size of the world. On Kant's account, it is entirely legitimate to postulate an initial condition from which a theory of the history of the world begins. What he deems problematic is the attempt to determine the absolute status of that initial condition and to draw conclusions from it concerning the size of the world as a whole. This does not mean that Kant maintains that there is an empirical question – is the world temporally finite or infinite? – to which science cannot provide an answer. It rather means that the question concerning the absolute beginning of the world is a question of a different kind. It is not an empirical question subjected to a scientific inquiry, but rather a transcendental question that requires a critical solution.

The chapter is divided into three parts. In the first section, I consider Kant's proofs of the thesis and antithesis of the first antinomy. In the second, I present the resolution of the antinomy. In the third section, I discuss the implications of the resolution of the first antinomy for cosmology.

5.1 Kant's Proofs of the Thesis and the Antithesis

Since the idea of the world is grounded in the hypothetical syllogism, and thus involves the relation of dependence,²⁰⁵ Kant's proofs in the first antinomy concern the series of past states and events as conditions of possibility of the present state of the world, and not the series of future states as consequences of the present.²⁰⁶

²⁰⁵ See above, section 3.2.1.

²⁰⁶ See: "Now in order to set up a table of ideas according to the table of categories, we first take the two original *quanta* of all intuition, space and time. Time is in itself a series (and the formal condition of all series), and hence in it, in regard to a given present, the *antecedentia* are to be distinguished *a priori* as conditions (the past) from the *consequentia* (the future). Consequently, the transcendental idea of an absolute totality of the series of conditions for a given conditioned applies only to all past time. According to the idea of reason, the whole elapsed past time is thought of as given necessarily as the condition for the given moment" (A411-12/B438-39).

Furthermore, both sides to the dispute assume that there is a determinate answer to the question concerning the beginning of the world, or, put otherwise, that the empirical world has a determinate temporal magnitude. We have already seen that this is equivalent to considering the world a thing in itself and assuming that the entire series of conditions of the present state of the world is given. As Kant puts it, “in accordance with the common and dogmatic way of representing it, we let the world of sense count as a thing whose totality is given in itself” (A521/B549, note). Since proponents on both sides of this debate assume that there is a determinate answer to this question, they each employ indirect proofs. That is to say, since both adversaries assume that the empirical world is either temporally finite or infinite (i.e. it either has a beginning in time or exists from eternity), they take the refutation of the opposite view as a proof for their own position.

The thesis asserts:

The world has a beginning in time, and in space it is also enclosed in boundaries (A426/B454).²⁰⁷

The proof of the temporal portion of the thesis runs as follows.

1. Suppose the world has no beginning in time.
2. Then every given point in time is preceded by an eternity.
3. Therefore, an infinite series of successive states of things in the world has already passed away.

²⁰⁷ Cf. the *Prolegomena* version of the thesis: “The world has, as to time and space, a *beginning (a boundary)*” (P §51, 4:339).

4. The infinity of a series means “that it can never be completed through a successive synthesis.”
5. Therefore, an infinite series of successive world-states is impossible.
6. Hence, the world is temporally finite and “a beginning of the world is a necessary condition of its existence” (A426-28/B454-56).

The proof of the antithesis alludes to the problem of the thought of the sensible world as a whole in the Dissertation. The strategy of this proof resembles that of the proof of the thesis of the second antinomy. As in the Dissertation, the root of the problem is that assuming that the empirical world as a whole has no beginning involves two conflicting logical requirements. This difficulty, in turn, provides the thrust of the proof of the thesis of the second antinomy. Recall that according to the thesis of the second antinomy, if we assume that physical objects are completely determined with respect to their parts, we must take their divisibility to be finite. If we assume otherwise, namely, that they consist of infinitely many parts, the notion of the complete series of parts (the requirement of *compositum*) is at odds with the notion of the never to be completed series (the requirement of infinity).²⁰⁸ Here too, the thought of a completely determined infinite *compositum* is considered impossible for the same reason.²⁰⁹ One cannot regard the present state of the world as completely determined

²⁰⁸ See above, section 3.1.

²⁰⁹ Like material objects and unlike space, the sensible world is a *compositum* (a proper composite) and not a *totum* (a whole). As a composite, the world depends on its parts and states. The latter are ontologically and logically prior to the world, in that the world cannot exist or be distinctly thought independently of them. In other words, in the case of the world, it is not that the whole is somehow given to us and then its parts are distinguished with the respect to the given whole. Rather, we grasp the world through the addition of its parts. The first antinomy thus turns on the notion of a complete *compositum*. The thrust of the proof of the thesis is that it is impossible to think of the world as a determined infinite *compositum*. Accordingly, Kant claims, with respect to the world conceived as an infinite totality, that “The concept of a totality is in this case nothing other than the representation of the completed synthesis of its parts, because, since we cannot draw the concept from an intuition of the whole (which is impossible in this case), we can grasp it, at least in the idea, only through the synthesis

if the total course of the world up to the present is infinite, since, if it were infinite, the notion of the complete series of world-states as conditions of the present would clash with the notion of the never to be completed series of world-states. Thus, since both sides to the debate agree that there is a determinate answer to the question concerning the beginning of the world, and since the world cannot be temporally infinite, one must conclude that the world is finite and has a beginning in time.²¹⁰

One finds further traces of the Dissertation's discussion of this issue in Kant's remarks on the thesis of the first antinomy. In the first section of the Dissertation, Kant criticizes those who propose a false definition of the infinite in order to make it easy to argue against the infinity of the world. Such thinkers regard "the *infinite* [as] *that magnitude than which a greater magnitude is impossible*; and the mathematical infinite [as] that multiplicity (of a unit which can be given) than which a larger multiplicity is impossible" (Diss §1, 2:388, note). Since notions such as the largest multiplicity and an infinite number are absurd, these thinkers easily refute the existence of actual infinity. Instead, Kant suggests to understand the infinite in terms of the property of that which is "never to be completed" of a series (Diss §2, 2:391). In this sense, the mathematical infinite is "a magnitude which, when related to a measure treated as a unit, constitutes a *multiplicity larger than any number*" (Diss §1, 2:388, note).²¹¹ In the remark on the thesis of the first antinomy, Kant distinguishes three notions of infinity. He similarly rejects the stratagem of proving the finitude of the world by presupposing a "defective concept" of infinity.

of the parts up to their completion in the infinite" (A428/B456). By contrast, proving the antithesis, involves attempting to demonstrate that the thought of the world as a completely determined finite *compositum* is impossible.

²¹⁰ For a similar analysis of the thesis, see Allison, 2004, pp. 369-72.

²¹¹ Kant further notes there that "*measurability* here only denotes relation to the unit adopted by the human understanding as a standard of measurement, and by means of which it is only possible to reach *the definite concept of a multiplicity* by successively adding one to one, and the *complete* concept, which is called a *number*, only by carrying out this progression in a finite time" (Diss §1, 2:388, note).

I could also have given a plausible proof of the thesis by presupposing a defective concept of the infinity of a given magnitude, according to the custom of the dogmatists. A magnitude is **infinite** if none greater than it (i.e., greater than the multiple of a given unit contained in it) is possible. Now no multiplicity is the greatest, because one or more units can always be added to it. Therefore an infinite given magnitude, and hence also an infinite world (regarding either the past series or extension), is impossible; thus the world is bounded in both respects. I could have carried out my proof in this way: only this concept does not agree with what is usually understood by an infinite whole. It does not represent **how great** it is, hence this concept is not the concept of a **maximum**; rather, it thinks only of the relation to an arbitrarily assumed unit, in respect of which it is greater than any number...

The true (transcendental) concept of infinity is that the successive synthesis of unity in the traversal of a quantum can never be completed. From this it follows with complete certainty that an eternity of actual states, each following upon another up to a given point in time (the present), cannot have passed away, and so the world must have a beginning.

Note: [A quantum which can never be completed] thereby contains a multiplicity (of given units) that is greater than any number, and that is the mathematical concept of the infinite (A430-32/B458-60).

Henry Allison suggests that the “mathematical concept” of infinity is the “schematized version” of the “true (transcendental) concept” of infinity. Whereas the former refers to natural number or the schema of quantity, and thus involves construction in intuition, the latter expresses the purely conceptual demand of the impossibility of completing the enumeration of the series. In other words, according to the “true concept” of infinity, it is a property of the infinite series itself that its enumeration cannot be completed, not that its construction in human intuition cannot be completed in a finite period of time. Accordingly, with respect to this notion of infinity, the “successive synthesis” is not to be taken psychologically as the process of actual construction in the human mind. This helps us ward off the charge that the

thesis argument for the finitude of the world assumes human subjective inability to construct an infinite series in a finite time and, therefore, begs the question. It further shows that Kant's concept of the infinite is not entirely incompatible with the modern, Cantorian notion.²¹²

In sum, the cosmological idea of the temporal magnitude of the world generates a regressive series of past states as conditions of the present, and there are two conflicting conceptual requirements concerning this series. On the one hand, the requirement of completely determined *compositum* demands that one think of the series as completely given. On the other hand, the requirement of infinity demands that one think of the series of past states as impossible to complete. The proponent of the metaphysical approach concludes that because the notion of a completely determined infinite *compositum* is impossible, one must think of the world as a completely determined finite *compositum*, namely, as having a beginning in time.

According to the antithesis,

The world has no beginning and no bounds in space, but is infinite with regard to both time and space (A427/B455).²¹³

The proof of the temporal portion of the antithesis runs as follows.

1. Suppose the world has a beginning.
2. A beginning of a thing is an “existence preceded by a time in which the thing is not.”

²¹² See Allison, 2004, pp. 367-70. For Russell's and Strawson's charges of subjectivism and *petitio*, as well as objections to Kant's conception of infinity, see Russell, 1914, pp. 156-57; Strawson, 1966, p. 176.

²¹³ Cf. the *Prolegomena* version of the antithesis: “The world is, as to time and space, *infinite*” (P §51, 4:339).

3. Therefore, there must have been an empty time (“a preceding time in which the world was not”).
4. Coming to be in an empty time is impossible, since no part of an empty time is in itself distinguished from any other with respect to the existence or non-existence of the thing coming to be.
5. Hence, “the world itself cannot have any beginning.”
6. Therefore, the world “in past time... is infinite” (A427-29/B455-57).

The proof of the antithesis of the first antinomy is the most problematic of all four of the proofs of the theses and antitheses of the mathematical antinomies. This proof clearly turns on assumption 4 and thus naturally calls Leibniz’s principles of sufficient reason and identity of indiscernibles to mind, and with them, Leibniz’s arguments against Newtonian absolute space and time.²¹⁴ Leibniz maintains that if space and time were absolute as Newton conceived them, God would have to create the world at a certain moment in the absolute, empty time. But since moments in empty time are homogeneous, no sufficient reason can be assigned to the decision to bring about the world at one time rather than at another.²¹⁵ His argument from the principle of the identity of indiscernibles is stronger. In it, Leibniz not only rejects the *fact* that absolute space and time do not exist, but also the very *conceptual possibility* of

²¹⁴ For references to Leibniz’s principle of sufficient reason, see Al-Azm, 1972, pp. 22-29; Guyer, 1987, p. 408; Bird, 2006, pp. 668-69; Senderowicz, 2010, pp. 27-28. For references to Leibniz’s principle of identity of indiscernibles, see Allison, 2004, p. 373.

²¹⁵ See Leibniz’s 3rd letter to Clarke, §6: “Supposing any one should ask, why God did not create every thing a year sooner; and the same person should infer from thence, that God has done something, concerning which ’tis not possible there should be a reason, why he did it so, and not otherwise: the answer is, that his inference would be right, if time was any thing distinct from things existing in time. For it would be impossible there should be any reason, why things should be applied to such particular instants, rather than to others, their succession continuing the same. But then the same argument proves, that instants, consider’d without the things, are nothing at all; and that they consist only in the successive order of things: which order remaining the same, one of the two states, viz. that of a supposed anticipation would not at all differ, nor could be discerned from, the other which now is.”

absolute space and time. On this argument, the concepts of absolute space and time are impossible, since they imply that “creating the world at t_1 ” and “creating the world at t_2 ” name two different events (t_1 and t_2 being different moments in an absolute, empty time), whereas they are in fact indistinguishable and consequently, according to the principle of the identity of indiscernibles, identical.²¹⁶ Based on these Leibnizian principles, the antithesis would amount to the claim that it is either *not the case* that the world came to be at a certain time, since no sufficient reason can be assigned to its coming to be at that particular time, or that it is *meaningless* to talk about such coming to be, since it is indistinguishable from coming to be at any other time.

The problem with interpreting the antithesis as essentially turning on these Leibnizian principles is that the antithesis reflects the position of the proponent of the mathematical approach, not that of the adherent of the metaphysical approach. It is thus not surprising that Kant does not mention these principles in the proof of the antithesis. One may argue that Kant furnishes the proponent of the mathematical approach with a proof which makes use of principles acceptable to her opponent, namely, the adherent of the metaphysical approach. Yet, ever since the 1750s, Kant held that relying on these principles diminishes the cause of the metaphysical approach. In the *Physical Monadology*, he deliberately avoided using the principle of sufficient reason in proving that bodies consist of monads, since he acknowledged that the principle was contentious.²¹⁷ In *New Elucidation*, he vehemently attacked the

²¹⁶ See Leibniz’s 4th letter to Clarke, §6: “To suppose two things indiscernible, is to suppose the same thing under two names. And therefore to suppose that the universe could have had at first another position of time and place, than that which it actually had; and yet that all the parts of the universe should have had the same situation among themselves, as that which they actually had; such a supposition, I say, is an impossible fiction.”

²¹⁷ In the scholium to proposition 2, Kant explains: “I have deliberately omitted the celebrated principle of the sufficient ground from the present demonstration. In omitting it, I have accomplished my

principle of the identity of indiscernibles.²¹⁸ Thus, if Kant had intended to provide a sound proof of the antithesis, it is likely that he would have taken a different course.²¹⁹ We may conclude that just as he was reluctant to base the case of the finitude of the world on a “defective concept” of infinity, so he would refuse to support the case of the antithesis by means of these controversial Leibnizian principles. Accordingly, we need an alternative reading of the proof of the antithesis, one which does not simply echo Leibniz’s arguments or essentially and directly derive from the principles of sufficient reason and identity of indiscernibles.²²⁰

The task, then, is to find an alternative way to read assumption 4 of the proof of the antithesis. This is not an easy task. We may begin with Kant’s remark that the proof is “drawn from the nature of the case” (A430/B458) and recall that the debate essentially involves the notion of the unconditioned totality of the world or a completely determined *compositum*. The thesis maintained that the series of conditions of an infinite *compositum* was inexhaustible and that the infinite

purpose by means of the ordinary combination of concepts to which all philosophers subscribe, for I was apprehensive that those who do not accept the principle of the sufficient ground would be less convinced by an argument which was based upon it” (PM 1:477).

²¹⁸ See NE 1:409-10. “Taken in its widest sense,” Kant remarks on the principle of the identity of indiscernibles, “it could not be further from the truth.” Compare this to Kant’s discussion of the principle in the *Critique*, in which he allows its applicability merely to “*intelligibilia*” (objects of pure understanding) or “concepts of things in general”: A263-64/B319-20, A271-72/B327-28, A281-82/B337-38.

²¹⁹ Kant indeed repeatedly asserts the cogency of the proofs he puts forward in support of the theses and antitheses. He declares that he is not interested in a “lawyer’s proof, which takes advantage of an opponent’s carelessness and gladly permits a misunderstanding of the law in order to build the case for his own unjust claims on the refutation of the other side.” He assures that “[e]ach of these proofs is drawn from the nature of the case” and demands that “any advantage that could be given to us by the fallacies of dogmatists on either side... be set aside” (A430/B458). See also A507/B535; P §52a, 4:340; P §52b, 4:341.

²²⁰ Accordingly, my view differs from that of Al-Azm, who argues that “the proof of the antithesis, along with its supplementary explanations, represents fairly accurately the grounds on which Leibniz and his followers rejected the Newtonian conception of space (and time) with its cosmological, philosophical, and theological implications,” and, in particular, that “the law of sufficient reason, as interpreted by Leibniz, is absolutely essential for supporting and maintaining the explicit and implicit claims of the antithesis.” Al-Azm concludes that “the strength of Kant’s proof for the antithesis derives from the general Leibnizian position and arguments against the claims of Newton and Clarke which permeate the whole of the first antinomy.” For Al-Azm, however, this indicates the cogency of the antithesis, not its weakness (Al-Azm, 1972, pp. 22, 28-29).

compositum therefore could not be thought of as completely determined. The antithesis analogously challenges the thought of the whole empirical world as a completely determined finite *compositum*. The argument for the antithesis may thus be summarized as follows.

If a finite empirical world is to be completely determined, the first member of the finite world-series has to be unconditioned or self-determining. Now consider the first member of the world-series, or the initial state of the world. It consists in some spatial arrangement of material things. Regardless of whether the world was initially arranged such that matter was diffused or condensed, decomposed or already organized into particular objects (stones, trees, animals), there appears to be nothing self-determining in any particular arrangement. Any such arrangement considered in itself still requires a further determining ground. Since it is a natural state which consists merely in a spatial arrangement of material things, one can think of a further condition on which it depends. Therefore, this supposedly initial state is not unconditioned. Nor can the empty time on which the initial state borders make it unconditioned, since the relation of the world to empty time is “a relation of the world to **no object**” (A429/B457). Put differently, the event of moving from empty time to the initial state requires a further condition which can be found neither in empty time nor in the initial state itself. The point can be illustrated in the following way. Suppose we have a successful cosmological theory which adequately accounts for the present state of the world and that it is possible to use this theory to project backwards to a certain initial state at some point in the remote past. Suppose further that the equations of this theory can provide no information regarding what happened before this initial state, or better, that within the limits of the theory there is no point in asking this question. It is nevertheless the case that, from of a more general point of

view, the question of the origin or condition of that initial state is meaningful and demands a solution. Our particular theory does not block the conceptual demand for a further condition on which this state depends, nor are we content with the answer that the equations of the theory cannot provide any.²²¹

In sum, the argument of the antithesis constitutes an attempt to undermine the possibility of an unconditioned first state of the empirical world. Since such a first state appears to be impossible, the empirical world, conceived of as a finite *compositum*, cannot be considered completely determined. Thus, the argument of the antithesis concludes that, since the empirical world as a whole cannot be finite, and since one assumes that it must be either finite or infinite, it follows that the world is temporally infinite and has no beginning in time.

5.2 The Resolution of the Antinomy

If Kant's proofs of the thesis and the antithesis of the antinomy are cogent, and if one assumes that the empirical world must be either finite or infinite, we find ourselves at an impasse. We are forced to choose between equally sound but opposite propositions concerning the temporal magnitude of the world. The resolution of this conflict is

²²¹ This point is put forward lucidly by Jay Rosenberg with respect to the Big Bang theory: "Consider, for example, the Big Bang theory of the origin of the physical universe. Any serious attempt to work out the conceptual consequences of the Big Bang theory, I think, inevitably generates a certain uneasiness. It is not difficult to *repeat* crude lay versions of what sophisticated physicists tell us – e.g., that the Big Bang was the beginning of both space and time, and that the physical universe has thereafter been continuously expanding – but it is rather more difficult to *understand* what that is supposed to mean, much less to *believe* it. What it presumably does mean – and what it is not so difficult to believe – is something like this: Given particular assumptions, when the values of the *s* and *t* parameters in certain equations descriptive of the dynamic evolution of the physical universe are considered retrospectively, they converge asymptotically to 0. But it is hard to shake the feeling that what *s* and *t* represent in such equations then *cannot* be our space and time, i.e., the order of before and after and here and there in our experience. For it certainly *seems* to make sense to ask, in terms of *that* perspectival space and anisotropic time what was going on *before* the Big Bang, and why it 'banged' just *then* and *there* and not earlier or later or somewhere else, and what was going on *here* when it was 'banging' *there*, and, come to think of it, what has the physical universe been expanding *into*?" (Rosenberg, 2005, p. 276).

parallel to that of the second antinomy and similarly depends on the distinction between phenomena and things in themselves. It consists in rejecting the underlying presupposition common to both rivals, namely, that the empirical world as a whole has a determinate temporal magnitude or that it is completely determined with respect to its extension in time (and space). In turn, Kant argues that the presupposition that there is a definite answer to the question whether the world is finite or infinite is equivalent to considering the empirical world a thing in itself. By rejecting the assumption that the empirical world is a thing in itself, we also renounce the underlying presupposition that the world must be either finite or infinite, thereby relieving ourselves of the need to choose between the two options.

Kant's rejection of the notion of the empirical world as a thing in itself turns on the transcendental distinction between phenomena and things in themselves. Both sides to the dispute take the empirical world as a thing in itself, that is to say, an intelligible object of pure understanding, the conditions of which are completely given with it.²²² The transcendently realistic conflation of phenomena and things in themselves is the basis for taking the spatiotemporal world as a completely determined totality with determinate temporal and spatial magnitudes, or alternatively, for regarding space and time as absolute determinations of the empirical world as a whole.

It is tempting to believe that the spatiotemporal world is determined one way or another, since we are dealing with the *empirical* world, not with some questionable, transcendent entity. It seems that the concept of the sensible world is an ordinary empirical concept, even if it is difficult to find out how it is determined. But, as we have seen, the spatiotemporal world, considered as an absolute totality, is not an

²²² See above, section 3.2.

object of possible experience. Thus, the concept of the empirical world is only pseudo-empirical. We “have the world-whole only in concept, but by no means (as a whole) in intuition” (A519/B547). That is to say, it is not a concept with a corresponding object, but rather an idea of reason. The idea has a regulative function and serves as a guide for the empirical investigation of the temporal size of the world. Our investigation never arrives at an absolute viewpoint from which we can determine whether the world is finite or infinite; it only advances further and further along the series of empirically conditioned states and events. The idea of the magnitude of the world thus yields the rule “that however far I may have come in the ascending series, I must always inquire after a higher member of the series, whether or not this member may come to be known to me through experience” (A518/B546).²²³ This does not mean that the world-series itself is infinite, but rather that our investigation of it proceeds indefinitely. It is not that the empirical world as a whole has a determinate magnitude which is “out there” to be found and discovered. Rather, we form some conception of how far the world extends in space and time through empirical investigation.

The merely general representation of the series of all past states of the world, as well as of the things that simultaneously exist in the world’s space, is nothing other than a possible empirical regress that I think, though still indeterminately, and through which alone there can arise the concept of such a series of conditions for a given perception. Now I always have the world-whole only in concept, but by no means (as a whole) in intuition. Thus I cannot infer from its magnitude to the magnitude of the regress, and determine the latter according to the former, but rather it has to be through the magnitude of the empirical regress that I first make for myself a concept of the magnitude of the world. About this regress, however, I never know anything more

²²³ See also A519-22/B547-50; A684-85/B712-13.

than that from any given member of the series of conditions I must always proceed empirically to a higher (more remote) member. Thus by that means the magnitude of the whole of appearances is never determined absolutely; hence also one cannot say that this regress goes to infinity, because this would anticipate the members to which the regress has not yet attained, and would represent their multiplicity as so great that no empirical synthesis can attain to it; consequently, it would **determine** (though only negatively) the magnitude of the world prior to the regress, which is impossible. For the latter (in its totality) is not given to me through any intuition, hence its magnitude is not given at all prior to the regress. Accordingly, we can say nothing at all about the magnitude of the world in itself, not even that in it there is the *regressus in infinitum*, but rather that we must seek the concept of its magnitude only according to the rule determining the empirical regress in it (A519/B547).

5.3 The Implications of the Resolution of the First Antinomy for the Pre-Critical and Modern Cosmological Theories

We have seen that in the case of the problem of composition and divisibility, the central notions and principles of the traditional view of the conflict which pervade the pre-critical writings still play an important role in the second antinomy. Kant does not completely reject these principles, but rather examines them from a transcendental point of view and reinterprets them as essential factors of human cognition. It is difficult to find a parallel treatment in the case of the question of the size of the world. There are, to be sure, clear connections between Kant's analysis of this issue in the Dissertation and the first antinomy. In particular, the problems of the thought of the sensible world as a whole and of the notion of infinity in the Dissertation are carried over to the *Critique*. But there are few or no traces of the cosmological discussions in *New Elucidation*, the *Universal Natural History*, and the *Only Possible Argument* in

the first antinomy. Nevertheless, the resolution of the first antinomy has implications for these discussions.

The implication for the metaphysical account of the beginning of the world is clear: the resolution of the antinomy invalidates it. We have seen that, according to the metaphysical account of *New Elucidation*, the world is a system of interacting substances. According to this theory, the absolute beginning of the world lies in God's creation of the substances and of the laws governing their interaction. The problem with the metaphysical account revealed by the antinomy does not lie in this account's reference to transcendent speculation concerning God's creation, but rather in the attempt to argue for an absolute beginning of the world as a whole. As we have seen, Kant's resolution of the antinomy consists in rejecting the assumption that the empirical world can be taken as a whole with a determinate duration. In short, Kant rejects the metaphysical account because it purports to claim that the world has an absolute beginning and thus regards the world as a whole with a determinate magnitude or as "a whole existing in itself."

Although the mechanical cosmology of the *Universal Natural History* is prone to the same verdict, we can still escape it. We have seen that Kant's actual account in the *Universal Natural History* begins with the postulation of an initial condition in which matter is decomposed into its primary elements and equally diffused in space. In the *Universal Natural History*, Kant seeks to establish a connection between the possibility that chaotically diffused matter may organize itself into a cosmos and the dependence of the cosmos on God and suggests that the emergence out of the initial condition is "the first formation of nature" (UNH 1:307, J 149; 1:320, J 160). We have also seen that the mechanical cosmology of the *Universal Natural History* may be taken to imply more naturally that there is no absolute initial condition, but rather

that the development of the world proceeds through an infinite cycle. The resolution of the antinomy rejects both options, since both options rest on the assumption that the empirical world as a whole has a determinate magnitude. Both purport to determine the absolute origin of the world and this, as we have seen, is tantamount to taking the empirical world as a thing in itself.

However, one need not completely reject the theory of the *Universal Natural History*. The problem does not lie in the mechanical account itself, but in the attempt to determine the status of the initial condition (whether it is the absolute beginning of the world or just another phase in the infinite cycle of nature) from which the account sets out. So long as one takes the initial condition as the point from which the theory begins, and not as an indication of the absolute origin of the world, it is perfectly legitimate. Viewed in this way, Kant's theory is not committed to any particular view regarding the magnitude of the world as a whole and thus avoids falling into the absurdities revealed in the antinomy.

The lesson to be drawn is not restricted to Kant's account in the *Universal Natural History* but rather applies to cosmology in general. It is legitimate to postulate an initial condition in a cosmological theory. Problems arise when one attempts to determine the status of the initial condition and to draw conclusions from it concerning the magnitude of the world as a whole. It is crucial to note that Kant's analysis does not mean that there is an empirical question, namely, whether the world is temporally finite or infinite, to which science cannot provide an answer. It rather implies that the question of the absolute beginning of the world is a *transcendental* question which requires a critical solution, since the concept of the empirical world as a whole is not an empirical concept, but rather an idea which, as we have seen, stems

from the incompatible requirements of the understanding and reason.²²⁴ Just as science cannot answer ethical questions (e.g. what is the moral ground of the imperative “you shall not murder”?) or aesthetic questions (what is the aesthetic worth of this painting?) because they are not scientific questions, so too in this case the problem is to be resolved by a transcendental reflection, and not by a scientific inquiry.

Allen Wood challenges Kant’s transcendental resolution of the antinomy.²²⁵ On Wood’s reconstruction of the argument, Kant maintains that if the empirical world were a thing in itself, that is, if its totality of conditions were given, there would have to be a fact of the matter concerning its finitude or infinitude, which would lead to the predicament of choosing between equally demonstrable contradictories. Wood dismisses the claim that the conditions of the world cannot be given as a totality by questioning Kant’s notions of the givenness and the totality of the conditions of the world.

Wood first considers Kant’s claim that because the world as a series of conditions cannot be given as a totality, it follows that, under the laws of experience established in the *Analytic*, we cannot have a direct experience of a first event in time or of an infinite series of past events. On this reading, however, the Antinomy’s argument rests on the assumption of transcendental idealism and therefore cannot serve to prove it indirectly. Wood then suggests a further, “more natural sense” of the term “given.” According to Wood’s suggestion, “given” means “existent” or “actual” in the sense of the Postulates of Empirical Thought. That is to say, givenness or actuality is something that is connected to some intuition by (empirical or transcendental) laws of

²²⁴ See section 3.2.2 above.

²²⁵ Wood, 2010, pp. 258-61.

experience. Kant needs this notion of actuality in order to admit the existence of objects and events which cannot be directly experienced (e.g. microscopic corpuscles, distant stars, and remote past events). The existence of the latter is inferred by their connection to some directly perceived evidence. “But if ‘given’ means ‘existent’ in that sense,” Wood argues, “then surely ‘the world’ (the various series of conditions of any given conditioned) is also ‘given’.”²²⁶ And if the world as a whole is indeed an object (i.e. the category of totality is applicable to it) given in this sense, then Kant does not manage to escape the contradiction implied in the antinomy. Wood thus argues that in order to salvage his view, Kant must refrain from applying the category of totality to the world.

Kant’s way of avoiding the contradiction, then, comes down to the claim that the category of totality cannot be legitimately applied to “the world” (to the various series of conditions that generate the antinomies). But it is not clear how he can avoid applying the category of *totality* to the series, any more than he could avoid applying the categories of *unity* or *plurality* to it. For surely each series is *one* series that has *many* members – and if so, why is it not a *whole* series – whose magnitude, therefore, must be either finite or infinite?²²⁷

My reply to Wood’s worry consists in distinguishing between the givenness of *particular* events or objects in the world, however remote in space or past time, and that of *all* events, states, and objects which constitute the empirical world as a whole (the “totality of appearances”). Wood is certainly correct in noting that for Kant, being given does not mean being directly perceived and that it is reasonable to understand givenness in the “more natural sense” of the Postulates’ conception of actuality. Particular objects and events are deemed actual when they are concretely

²²⁶ Ibid., p. 260.

²²⁷ Ibid.

connected to the available evidence. Dinosaurs, for example, are considered actual living creatures of the past, since their existence is established by the evidence of their fossilized remains in sediment deposits and the theoretical principles of paleontology. Paleontologists have inferred that dinosaurs dominated the earth for approximately 160 million years, up to about 65 million years ago, and have catalogued hundreds of species of them. Fossil records and other evidence allow them to conjecture as to the physiology, behavior, nourishment, distribution, evolution, and extinction of dinosaurs. They speculate, for example, that dinosaurs became extinct 65 million years ago due to the after-effects of a collision between an asteroid and the earth. These creatures and events are thus considered actual, not merely figments of our imagination. We may also claim that further discoveries of fossil traces or theoretical and technical advancements in paleontology and related areas will provide information on other actual species of dinosaurs and other actual events in their lives which are not yet known to us.

The totality of appearances, by contrast, is not given in a similar way. There is no concrete link between each and every appearance and directly perceived evidence. Moreover, it appears that we cannot even picture what discoveries or advancements would be required in order to connect *all* objects and events in our world into a unified totality. Of course, we may abstract from our actual experiences in the world and think of a world-series as *one* series which consists of *many* connected members (whatever those members may be and however they may be connected) and which encompasses *all* the members of the world-series. This, however, is an idealization or mere logical combination of the concepts of series, members of a series, unity, plurality, and totality. In thought, we simply attach the concept of totality to that of a series and thereby form an abstract concept of a world. But because we do not create

our objects merely by logically combining concepts, we cannot say that there is an actual object corresponding to this abstract concept. This is what Kant means when he argues that we “have the world-whole only in concept, but by no means (as a whole) in intuition” (A519/B547). The pure concept of “a world in general” is only an idea of reason.²²⁸ *Our world*, on the other hand, is given (in Wood’s “more natural sense”) only gradually through its empirical investigation, which expands further and further in space and time (unlike the investigation of dinosaurs, which concentrates on a specific era in a certain place). It is not given prior to or independently of this investigation, which reveals and connects more and more appearances. Consequently, there is no pre-determined, given fact of the matter concerning the temporal magnitude of the world as a whole waiting there to be discovered. As Kant puts it, “it has to be through the magnitude of the empirical regress that I first make for myself a concept of the magnitude of the world” (A519/B547).²²⁹

Wood contests Kant’s claim that there is no fact of the matter concerning the beginning of the world. He seems to favor the view that there is a fact of the matter which we may simply not be able to determine. We may come to know it, if at all, by means of empirical science alone.²³⁰ Kant’s reply would be that the cosmological

²²⁸ See A684-85/B712-13.

²²⁹ See also: “since the world cannot be given **as a whole**, and even the series of conditions for a given conditioned, as a world-series, **cannot be given as a whole**, the concept of the magnitude of the world is given only through the regress, and not given prior to it in a collective intuition. But the regress consists only in a **determining** of the magnitude, and thus it does not give a **determinate** concept, a concept of a magnitude that would be infinite in regard to a certain measure; thus it does not go to infinity (given, as it were), but goes only indeterminately far, so as to give a magnitude (of experience) that first becomes actual through this regress” (A522-23/B550-51).

²³⁰ Wood reviews earlier classic and scholastic arguments for the temporal finitude and infinitude of the world. He lists Aristotle and Averroes as advocates of the finitude thesis, and John Philoponus, Richard Rufus of Cornwall, St. Bonaventure, and Richard Bentley as supporters of the infinitude thesis. He adds that in the scholastic discussions, there was also the position of Aquinas and Ockham, according to which neither thesis can be demonstrated by philosophical arguments. Their position, according to Wood, is thus in accord with the currently accepted view that the issue is to be decided empirically, if at all: “Aquinas and Ockham regard the beginning of the world as something that cannot be demonstrated by philosophical argument, but may be known from the authority of scripture (*Genesis* 1:1). Their view is therefore the one most of us accept today – that whether the world had a beginning

question is set for us not empirically by a fact or an object which demands further elucidation, but by an abstract concept of a world in general, an idea which “is merely a creature of reason.” We cannot therefore evade the issue by professing our ignorance or inability to decide the question, a maneuver that is open to us in empirical investigations. Rather, “the very same concept that puts us in a position to ask the question must also make us competent to answer it, since the object is not encountered at all outside the concept” (A477/B505). Answering the cosmological question does not mean deciding it one way or another, but rather providing a critical resolution to the problem.²³¹ Again, the question of the absolute origin of the empirical world is not an empirical or a scientific question, but rather a transcendental question requiring a critical resolution.

Graham Bird also reads the antinomy as turning on decidability or verifiability, but contends that the matter is in principle undecidable due to the lack of *any* evidence either way.²³² He maintains that Kant’s argument in the Antinomy applies not only to traditional, transcendent cosmology but also to contemporary, empirical cosmology, since both similarly conceal a temptation to move to undecidable inquiries.²³³ According to the Big Bang theory, for example, the observed expansion of the physical world is the result of a vast expansion from a primordial form of material existence or “singularity.” This theory thus relies on the assumption of an initial state from which the world started. On the face of it, this is a piece of modest scientific reasoning that remains within the limits of possible experience, since it does not concern the origin of that primordial state itself and does not pretend, as the

is knowable, if at all, only empirically (though we would be more likely to rest our empirical arguments for the Big Bang on radioastronomy than on Holy Scripture)” (Wood, 2010, pp. 253).

²³¹ See Kant’s discussion in section 4 of the Antinomy chapter, entitled “The transcendental problems of pure reason, insofar as they absolutely must be capable of a solution” (A476-84/ B504-12).

²³² See above, note 112.

²³³ Bird, 2006, pp. 677-80.

traditional accounts did, to find its transcendent grounds. But in fact, contemporary cosmologists are also tempted to “go transcendent.” The temptation has to do primarily with attempts to account for this singularity, which is “liable to function in the same way as Kant’s ‘unconditioned’ and to be just as problematic,”²³⁴ and with the debate over whether the absolute origin of the world consists in this singularity or in an endless cyclical development of successive expanding and contracting phases. The debate, Bird maintains, does not turn on any available data but instead centers on purely theoretical considerations of consistency of mathematical models.

These steps tempt a move to transcendence on two grounds. First, a direct step from the consistency of a mathematical model to the character of the [physical universe] encourages a Platonist conception of the kind Hawking ascribes to Penrose. Second, to suppose on these grounds that the [physical universe], as a “world-whole,” *does* develop in the suggested way is to make a claim which may really be undecidable by us. It remains unclear what further evidence might be used to reach a decision and it contains a requirement which seems unsatisfiable, namely, that the cycle did not itself begin at any stage. Not only is it difficult to see how such a requirement could be met, but it is evident that this is the kind of issue raised in the traditional debates and which Kant himself addresses and resolves in the cosmological Antinomies. Once the debate has moved in that direction Kant’s resolution marks the step into transcendence and undecidability and rejects it, but the suggestion is that contemporary scientific cosmology faces the same temptations.²³⁵

Bird claims that proponents of both views considered in the first antinomy adopt the dubious assumption that we can decide cosmological issues through *a priori* arguments alone. Consequently, both sides are “led to make claims about the universe as a thing in itself, and both are mistaken because we can strictly neither *affirm* nor

²³⁴ Ibid., p. 678.

²³⁵ Ibid., pp. 679-80.

deny such claims about things in themselves.”²³⁶ Similarly, contemporary cosmologists err when they make inferences to the character of the physical world not from any available evidence, but from purely conceptual and mathematical considerations.

It seems reasonable to argue that there can be no available data with which to decide the contemporary cosmological debate concerning the absolute origin of the physical world and that when modern cosmology engages in this problem, it moves from empirical to transcendent inquiries. But construing the cosmological debate as a conflict over a fact which simply cannot be decided either way by any available evidence does not explain why, to begin with, we come to form equally valid but contradictory propositions concerning that fact. It is one thing to be mistaken in claiming something which cannot be established by any available data, and quite another to be led to form equally sound contradictory claims. Thus the problem is not that the two parties make claims about things in themselves, since there is nothing in this move which necessitates arriving at contradictory claims. It is rather that they, as Bird writes, “make claims about the universe as a thing in itself.” That is to say, they affirm or deny claims not about purely intelligible entities, but about appearances (the physical world) that are taken to be things in themselves. They are not merely “making thoughts into things and hypostatizing them” (A395). Rather, they are mixing hypostatized intelligible entities and ordinary objects of possible experience.²³⁷ The source of the two-sided illusion at the heart of the antinomy lies precisely in this twofold manner of treating the world and involves the unique nature of the rational idea of the world. This idea, as we have seen, is not a concept of a

²³⁶ Ibid., p. 674.

²³⁷ See A478-79/B506-07.

possible object. Rather, it arises from the incompatible requirements of the understanding and reason.²³⁸ One cannot say, therefore, that the idea represents an object (the empirical world as a whole), the magnitude of which cannot be decided by any available data.

In conclusion, Kant's criticism is directed at any cosmological attempt which assumes that the universe as a whole is a proper object of investigation. It thus not only targets dogmatic traditional doctrines with their typical decisiveness, but also modern scientific cosmology, which may at times seem more cautious as to the results of cosmological inquiries. The criticism in the Antinomy chapter also applies to Kant's earlier attempts in the field. In particular, Kant rejects the metaphysical doctrines of *New Elucidation* and the *Only Possible Argument*, which purport to postulate a definite origin to the world. The cosmological theory of the *Universal Natural History*, on the other hand, may not be problematic as long as the initial state of chaotically diffused matter is taken as an assumption from which the theory set out, and not as an absolute origin of the universe, or in Bird's terms, as long as the theory stays empirical and does not "go transcendent."²³⁹ In short, Kant does not undermine cosmology as a legitimate scientific discipline. Instead, he determines its proper object of inquiry and appropriate aims. Cosmology may rightfully aspire to explain the present state of the world by assuming a certain initial state from which the world

²³⁸ See above, section 3.2.2.

²³⁹ This is part of the reason why, late in life, Kant still esteemed the theory of the *Universal Natural History*, despite his overall dismissal of his pre-critical writings. In a letter to Johann Heinrich Tieftrunk of October 13, 1797 Kant accepts the latter's suggestion to publish a collection of his minor writings. His only requests are that the collection not include any text prior to the Dissertation and that he see the collection before it is printed: "I agree to your proposal to publish a collection of my minor writings, but I would not want you to start the collection with anything before 1770, that is, my Dissertation 'On the Form of the Sensible World and the Intelligible World, etc.' I make no demands with regard to the publisher and I do not want any emolument that might be coming to me. My only request is that I may see all the pieces to be printed before they come out" (12:208). Even so, in a letter to Johann Friedrich Gensichen of April 19, 1791, Kant expresses his satisfaction with the fact that recent astronomical observations and findings agreed with the theory of the *Universal Natural History*. See also Polonoff, 1973, p. 110, note 87.

has evolved and to reveal further and further remote states and events *in* the world. The idea of the world, as a regulative idea, prescribes precisely this indefinite extension of the cosmological inquiry. Cosmology may not, however, make any claim concerning the first beginning or eternity *of* the world, since the world as a whole is not an object for us.²⁴⁰

Kant's move thus consists in shifting from an attempt to actually solve the problem of the size of the world to a transcendental investigation into the nature of the problem itself. His general reflections on the concept of a world in the Dissertation constitute a crucial step toward the new conception of the problem in the Antinomy chapter. In his earlier texts, Kant simply attempted to decide the cosmological debate. In the Dissertation, by contrast, he takes a deeper look into the difficulty involved in thinking and representing the world as a totality. However, in the Dissertation he still appears to hold that the difficulty can be bypassed by means of the separation doctrine. In the Antinomy, he finally realizes that the question of the magnitude of the world poses a problem of a different kind and requires a different kind of treatment. More specifically, he recognizes that the question is not empirical, but rather transcendental, and that it accordingly requires a critical solution. Kant's transcendental investigation into this question reveals that the concept of the sensible world as a whole does not refer to an empirical object, but is merely an idea of reason. Thus, because the world is not an actual object whose size could be either finite or infinite, the conflict concerning the size of the empirical world is illusory. Kant's transcendental inquiry also limits our legitimate expectations from scientific cosmology. We cannot look to scientific cosmology to replace rational cosmology in

²⁴⁰ See A522/B550.

attempting to account for the absolute origin of the universe, since, again, the world as a whole is not an actual object.

Chapter 6: The Antinomy of the Teleological Power of Judgment

The question of whether the world is designed teleologically constitutes an additional problem over which the metaphysical and the mathematical approaches to understanding nature differ. The problem consists of two related questions. First, does nature evolve in a purely mechanical manner, or is there also final causality in nature? Second, is it possible in principle to explain all natural phenomena by mechanical principles, or should one also employ teleological principles in the study of nature? The mathematical approach advances a thoroughly mechanistic view of nature and science, while the metaphysical approach in this context also emphasizes the place of purposiveness and final causality in nature. Encounters with organisms initially give rise to the question of teleology. From the very beginning, Kant assumes that all inanimate phenomena occur by means of mechanical causality and must be explained in mechanical terms. However, he was not sure whether living phenomena also evolve mechanically and whether a mechanical explanation is adequate in their case as well.

In the *Universal Natural History* and the *Only Possible Argument*, Kant presents conflicting answers to the question of teleology. Organisms are not the main subject of the *Universal Natural History*, which, as we have seen in the previous chapters, assumes the point of view of the mathematical approach. Nevertheless, in this work, Kant implies that organisms, like everything else in the world, evolve mechanically and should be explained mechanically. By contrast, in the *Only Possible Argument*, Kant adopts a staunchly metaphysical view in the context of teleology. In this work, Kant asserts that organisms exhibit purposive features and are part of the contingent

order of nature. Therefore, they cannot evolve by means of mechanical causality alone. Rather, God intervenes in their creation. This means that a complete mechanical explanation of an organism is impossible. The lesson of the pre-critical accounts thus seems to be that naturalness and purposiveness exclude one another. Adhering to a naturalistic view of organisms excludes the possibility of attributing purposive features to them, while acknowledging their purposive features entails a designer, and thus undermines their status as natural things.

In the *Critique of the Power of Judgment*, Kant abandons the pre-critical, dogmatic approach to the problem. Like all traditional systems of teleology, the teleological theories presented in the *Universal Natural History* and the *Only Possible Argument* try to resolve the problem by attempting to determine whether organisms actually have purposive features. In the third *Critique*, by contrast, Kant construes the problem as a conflict between two subjective maxims for explaining the existence and forms of organisms, namely, as an antinomy between two regulative maxims of the reflective power of judgment. According to the first regulative maxim (the thesis), all material objects are to be explained purely mechanically. According to the second (the antithesis), investigations of some material objects must appeal to final causes. Understanding mechanism and teleology in this way opens the possibility of fruitfully combining the two in an empirical investigation of living phenomena. Unlike the pre-critical analyses of the conflict, the resolution of the teleological antinomy in the third *Critique* involves an account which acknowledges the fact that we conceive organisms both as natural and as purposive.

This chapter is divided into four parts. In the first section, I deal with the pre-critical doctrines of teleology that Kant puts forward in the *Universal Natural History* and the *Only Possible Argument*. In the second section, I consider Kant's analysis of

the conceptual difficulties posed by organisms in the third *Critique*. According to this analysis, the difficulties lie in the fact that we grasp organisms by means of the apparently contradictory notion of “natural end.” In the third section, I present the teleological antinomy and its resolution. Finally, in the fourth section, I examine modern objections to Kant’s theory of the life sciences and respond to them.²⁴¹

6.1 The Pre-Critical Accounts of Teleology

The two major early texts dealing with organisms are the *Universal Natural History* and the *Only Possible Argument*. They differ on the issues of the causal structure of organisms and the proper mode of explaining them. They differ, that is, on the question of whether there is teleological causality in nature in addition to mechanical causality, and on the question of whether it is possible to explain all natural phenomena by means of mechanical principles alone. In the *Universal Natural History*, Kant advances a thoroughly mechanical account of the world and suggests that organisms evolve mechanically, and thus that it is possible, at least in principle, to provide a mechanical account of organisms as well. In the *Only Possible Argument*, by contrast, Kant maintains that organisms do not evolve purely mechanically, but were purposively designed by God. Accordingly, the explanation of organisms has to take the divine purposive design into account. However, Kant’s methodological

²⁴¹ In the present chapter, I concentrate on Kant’s analysis of living phenomena in the *Universal Natural History*, the *Only Possible Argument*, and the third *Critique*. Additional texts that deal with this subject are *On the Different Races of Humankind* (1775), *Determination of the Concept of a Human Race* (1785), and *Concerning the Employment of Teleological Principles in Philosophy* (1788). For discussions of Kant’s views in these writings, see Zumbach, 1984, pp. 101-03; McLaughlin, 1990, pp. 29-32; Grene and Depew, 2004, pp. 116-20. For overviews of the development of biological thought in the 17th and 18th centuries with special focus on those doctrines that were dominant in 18th century Germany (i.e. preformation and epigenesis) and writers on the subject who influenced Kant and with whom he was in contact (e.g. Buffon and Blumenbach), see Zumbach, 1984, pp. 79-86; McLaughlin, 1990, pp. 7-32; Fry, 2000, chapters 2-3; Grene and Depew, 2004, chapters 2-4; Ginsborg, 2006, pp. 455-56; Smith, 2006.

instruction in both texts is similar, namely, to extend the mechanical account as far as possible, despite the difficulties involved in explaining the phenomena of life mechanically.

In the *Universal Natural History*, Kant purports to provide a cosmological theory of the universe as a whole. He is not primarily interested in living phenomena in this text. Consequently, he does not provide a thorough analysis of organisms. Nevertheless, in the later parts of this work, Kant tries to provide a mechanical explanation of some aspects of the organic realm. He attempts to connect the evolution of life with material conditions and argues that intellectual capacities develop in proportion to the growth of body.²⁴² He also tries to anchor differences in rational capacities among intelligent creatures in physical factors in the following way. According to his cosmology, the denser and heavier materials are closer to the sun, while the finer and lighter are further removed from it. Because living creatures are completely dependent on the composition of the materials that constitute their bodies,²⁴³ it follows that their distance from the sun determines their physical, mental, and even moral functioning. A creature's proximity to the sun is positively correlated with the density and heaviness of its body, and hence with the coarseness of its functions. Creatures living in regions farther from the sun are swifter in their movements and their responses to their surroundings, receive more impressions from outside, form clearer ideas and join them in more sophisticated combinations, are less afflicted by death and decay, and perhaps even less liable to sin.²⁴⁴ Thus, even though organic nature is highly complex, Kant seems to think that the form and behavior of living creatures admit of mechanical explanation.

²⁴² See UNH 1:355-56.

²⁴³ UNH 1:355.

²⁴⁴ UNH 1:351-66. See also 1:330-31.

In the *Universal Natural History*, Kant appears quite optimistic about the scope of mechanical explanations in general. He sets out to show that the present order of the entire universe arose gradually and mechanically through natural laws and causal forces inherent in matter, and not through divine intervention. He maintains that his project is feasible because of the simplicity of its subject matter. His cosmological theory deals with the general features of the universe as a whole, rather than with specific details of particular, complex phenomena. These general features – the spherical form of celestial bodies, their motion in circular orbits, and the emptiness of the space in which they move – are quite simple and can be quite conveniently explained in mechanical terms alone. Thus, in the case of cosmological phenomena, one is in a position to claim “give me matter only and I will build you a world out of it” (UNH 1:229-30, J 87-88). Living phenomena, on the other hand, exhibit a higher degree of complexity than cosmological phenomena, and a mechanical explanation in their case is a significantly more complicated task. Nevertheless, Kant does not rule out the possibility of mechanically explaining the nature of organisms. He merely stresses that due to the simplicity of cosmological phenomena, it is reasonable to expect that we will develop a sufficient mechanical account of these phenomena *before* a similar account of living phenomena will be suggested.

Is one in a position to say: *Give me matter and I will show you how a caterpillar can be generated?* Does one not remain here stuck with the first step owing to the ignorance of the real inner structure of the object and of the complication of the manifoldness present in it? One must not therefore take it as strange if I am ready to say: that the formation of all celestial bodies, the cause of their motions, in brief, the origin of the whole present arrangement of the world-edifice,

will be understood before the production of a single herb or of a caterpillar will become evidently and completely clarified from mechanical reasons (UNH 1:230, J 88).²⁴⁵

Commentators have read this passage in two different ways. Some commentators read it as a straightforward rejection of the possibility of explaining organisms in mechanical terms. Werkmeister, for example, writes: “Kant asks, are we in a position to say: ‘Give me matter, and I will show you how a caterpillar can be produced?’ His answer is an emphatic No!”²⁴⁶ John McFarland also reads Kant’s answer to this question as emphatically negative. On his reading, Kant maintains that “whereas one can say ‘Give me matter and I will build a world from it’, one cannot say, ‘Give me matter and I will show you how a caterpillar can be produced’.”²⁴⁷ Hannah Ginsborg similarly suggests that in the *Universal Natural History* and the *Only Possible Argument*, “Kant explicitly rejects the view that the fundamental forces of matter alone... could account for the existence of plants and animals.”²⁴⁸ Nevertheless, other commentators have emphasized Kant’s claim that explaining organisms mechanically is complicated, but not impossible. Peter McLaughlin contends that in the *Universal Natural History*, Kant maintains that explaining organisms mechanically is not impossible in principle, even if it faces difficulties of a technical nature. McLaughlin argues that Kant’s position in this text “cannot be interpreted as a rejection in principle of the possibility of a mechanistic explanation or a mechanical production of organisms.”²⁴⁹ Peter Fenves similarly explains that “[a]lthough Kant insists [in the *Universal Natural History*] that the construction of the heavens is vastly less complicated than ‘the generation of a single herb’..., he nowhere rules out the

²⁴⁵ I have slightly modified Jaki’s translation.

²⁴⁶ Werkmeister, 1980, p. 9.

²⁴⁷ McFarland, 1970, p. 58, note 1.

²⁴⁸ Ginsborg, 2006, p. 456.

²⁴⁹ McLaughlin, 1990, p. 25.

possibility that someone may come to an understanding of how animals are formed out of lifeless matter.”²⁵⁰

The former reading of the passage ascribes to Kant the view that not only will cosmological phenomena be mechanically explained *before* organisms will be so explained, but also that the latter, unlike the former, simply cannot be elucidated in mechanical terms.²⁵¹ However, Kant does not reject the view that living phenomena can be mechanically explained in terms of matter and motion. On the contrary, despite the fact that he clearly recognizes the difficulties involved in such a project, he does not dismiss it. Again, his point is merely that due to the high degree of complexity exhibited in the structures of living creatures, it is more difficult to explain their forms mechanically than it is to explain cosmological phenomena mechanically. He does not think that it is impossible to provide a mechanistic explanation of the forms of living creatures or that an attempt to provide such an explanation is absurd.²⁵² On Kant’s view, the difference between cosmological phenomena and organisms is merely one of degree of complexity. He does not suggest that this difference in degree is so significant that it amounts to a category difference that would compel one to pursue different methods of inquiry. Thus, mechanical explanations are applicable to the study of both inanimate and living phenomena, though with varied degrees of success.

²⁵⁰ Fenves, 1991, p. 29. See also Plonoff, p. 114, note 92.

²⁵¹ McFarland’s reading seems to turn on a mistranslation. He omits the word “eher” (before) and renders “eher” as “rather than” instead of “earlier” or “sooner,” thereby eliminating the temporal aspect of Kant’s sentence (McFarland, 1970, p. 58, note 1). The relevant passage in German reads: “Man darf es sich also nicht befremden lassen, wenn ich mich unterstehe zu sagen: daß *eher* die Bildung aller Himmelskörper, die Ursache ihrer Bewegungen, kurz, der Ursprung der ganzen gegenwärtigen Verfassung des Weltbaues werde können eingesehen werden, *ehe* die Erzeugung eines einzigen Krauts oder einer Raupe aus mechanischen Gründen deutlich und vollständig kund werden wird” (1:230, italics added). Cf. the construction “eher-ehe” in the entry “eher” in Grimm’s *Deutsches Wörterbuch*.

²⁵² Ginsborg maintains that the passage under discussion *prefigures* Kant’s famous claim that there will never be a Newton of a blade of grass (Ginsborg, 2001, p. 241; 2004, p. 41). But whereas in the *Critique of the Power of Judgment*, Kant rejects the possibility of mechanically explaining organisms as absurd (see CJ §75, 5:400; §77, 5:409), in the *Universal Natural History*, he dismisses this possibility as patently absurd neither in the passage quoted above nor elsewhere in the book.

By contrast, in the *Only Possible Argument*, Kant argues that the difference between living phenomena and cosmological (and other inanimate) phenomena is a difference in kind, not merely in degree of complexity. Living phenomena and inanimate phenomena involve different types of causality. The latter belong to the necessary order of nature, while the former pertain to the contingent order of nature. As we have seen, phenomena belonging to the necessary order of nature result from the essential properties of matter and evolve due to the efficacy of the forces of matter alone. Contingent features of phenomena, on the other hand, do not depend on the essence of matter and laws of motion alone, but are purposely instituted by God. Hence, one cannot hope to provide complete mechanical explanations of contingent, living phenomena. In contrast to his view in the *Universal Natural History*, Kant here explicitly claims that “it would be absurd [*ungereimt*] to regard the initial generation of a plant or animal as a mechanical effect incidentally arising from the universal laws of nature” (OPA 2.4.2, 2:114). One can thus understand why the summary of the cosmological theory of the *Universal Natural History* that Kant affixes to the *Only Possible Argument* omits the mechanical explanation of living phenomena at the end of the *Universal Natural History*.²⁵³

²⁵³ The difference between Kant’s views in the *Universal Natural History* and in the *Only Possible Argument* is sometimes blurred in the literature. The short summary of the cosmological theory in the *Only Possible Argument* is taken as a simple recapitulation of the position of the *Universal Natural History*, and the different views expressed in the two books with regard to the nature of living phenomena is left unnoticed. The positions of the two books are coupled together either as jointly claiming that the difference between inanimate and living phenomena is merely one of scale or degree of complexity or as jointly rejecting the possibility of mechanical account of organisms. Fenves, for example, argues that in the *Only Possible Argument* Kant regards the endeavor to explain mechanically living phenomena as futile due to the “microscopic scale of the investigation” (Fenves, 1991, p. 29, note 11), and not on account of the fact that they are part of the contingent order of nature. Ginsborg, on the other hand, maintains that the cosmological theory of the *Universal Natural History* is “recapitulated” in the *Only Possible Argument* and that both books reject the possibility of explaining mechanically living phenomena (Ginsborg, 2004, p. 41, and see also 2001, pp. 240-42; 2006, p. 456). Martin Schönfeld also stresses the similarities but downplays the differences between the two books. He describes the relations of the *Only Possible Argument* to the *Universal Natural History* in terms of “restatement,” “recapitulation,” and “reiteration.” Even when he refers to the differences between the cosmogonies discussed in the two books, he ignores the omission of the mechanical explanation of

Despite the difference between his views concerning living phenomena in the *Universal Natural History* and in the *Only Possible Argument*, Kant's methodological instruction in both books is the same, namely, to extend the mechanical account as much as possible. In the *Universal Natural History*, Kant engages in this mode of investigation, since it fits the mechanical type of causality that, according to this work, pervades nature. In the *Only Possible Argument*, he recommends the same methodological rule, despite the distinction he draws in this work between necessary and contingent orders of nature, for two reasons. First, the necessary and contingent orders are intertwined. Organisms have both necessary and contingent aspects, and it is not always possible to clearly distinguish between them. Second, the mechanical method is more philosophical, in that it does not allow one to rest content with the easy path of claiming that God is responsible for the fact that phenomena exhibit order and usefulness. Instead, this method leads us to laboriously attempt to subsume as many features under natural laws as possible. Accordingly, since there is no clear line between the two orders of nature, and since the mechanical method is more philosophical, one is instructed to "presume that the necessary unity to be found in nature is greater than strikes the eye" and to extend the mechanical mode of explanation as far as possible (OPA 2.6.3, 2:126-27).²⁵⁴

In sum, the *Universal Natural History* and the *Only Possible Argument* contain different answers to the ontological and methodological issues at stake. In the *Universal Natural History*, Kant suggests that everything happens in accordance with mechanical causality, and that all natural phenomena can in principle be explained mechanically, even if in certain cases (e.g. in the case of organisms) any such

living phenomena in the *Only Possible Argument* (See Schönfeld, 2000, pp. 192, 193, 195, 291-92 note 21). Peter McLaughlin, by contrast, observes that in the *Only Possible Argument* Kant's view concerning living phenomena "had changed considerably" (McLaughlin, 1990, p. 27).

²⁵⁴ See also OPA 2.6.4, 2:134-37.

explanation would have to be rather convoluted. In the *Only Possible Argument*, he maintains that certain things in nature exhibit purposiveness and, therefore, could not have evolved by means of mechanical causality alone. Rather, God purposively created them. He further argues that although we should pursue mechanical explanations as much as we can, some natural phenomena (i.e. organisms) will never be fully explained in mechanical terms. It therefore seems that the lesson to be learned from the pre-critical accounts of the problem of teleology is that naturalness and purposiveness exclude one another. If one adopts the mathematical approach and advances a naturalistic account of organisms, one appears to be obliged to deny their purposive features. On the other hand, if one adopts the metaphysical approach and acknowledges the purposive features of organisms, it seems that one is thereby committed to the view that organisms are the product of an intelligent designer, which means that they are not natural things.

6.2 The Analysis of the Conceptual Difficulties Posed by Organisms in the Critique of the Teleological Power of Judgment

Kant addresses the clash between naturalness and purposiveness in his investigation of organisms in the *Critique of the Power of Judgment*. In the second part of the third *Critique*, entitled the “Critique of the Teleological Power of Judgment,” he discusses the place of purposiveness in nature and analyzes the conceptual difficulties posed by organisms.²⁵⁵ He purports to clarify the ground of these difficulties and to resolve

²⁵⁵ In the *Critique of the Power of Judgment*, Kant discusses purposiveness in three domains: aesthetics, theorizing, and nature. In the first two domains, purposiveness is subjective, while in the third, it is objective. In aesthetics, purposiveness has to do with the condition of the cognitive powers and the representational state of the subject. In theorizing, Kant identifies a purposiveness which he labels “formal” or “logical.” This purposiveness is a transcendental principle of the reflective power of

them. As he suggested in the pre-critical accounts, this ground lies in the fact that we must regard organisms in two apparently incompatible ways, namely, as natural things and as exhibiting purposive features (i.e. as “natural ends”). I examine this point in the present section.

Empirical encounters with organisms introduce a type of causal structure that differs from that which is regarded as the standard natural causality. Organisms appear to resist the standard mechanical model of explanation because they exhibit inner organization, the possibility of which one cannot comprehend solely by mechanical reasoning and without appealing to final causes. Organisms force us, as it were, to admit purposiveness in nature and to introduce teleology into natural science.

Organized beings are thus the only ones in nature which, even if considered in themselves and without a relation to other things, must nevertheless be thought of as possible only as its ends, and which thus first provide objective reality for the concept of an **end** that is not a practical end but an end of **nature**, and thereby provide natural science with the basis for a teleology, i.e., a way of judging its objects in accordance with a particular principle the likes of which one would otherwise be absolutely unjustified in introducing at all (since one cannot at all understand the possibility of such a kind of causality *a priori*) (CJ §65, 5:375-6).²⁵⁶

judgment that asserts an “agreement of nature with our faculty of cognition” (CJ 5:185), namely, a principle that makes it possible for us to advance in fulfilling our cognitive enterprise of putting the vast multiplicity of phenomena and empirical laws into a unified system of nature. Kant introduces this type of purposiveness in the published Introduction to the third *Critique* and in an earlier draft commonly referred to as the “First Introduction” (for an analysis of the reflective judgment and formal purposiveness in the Introductions, see Allison, 2001, pp. 13-42). Finally, in the third domain, namely in nature, purposiveness is assumed to pertain to objects. This objective purposiveness is either formal or real (material); that is, it either has to do with the geometrical form of the object, or with the concept of an end by which the object is possible (See CJ FI 20:232; CJ §62, 5:364). For the most part, in the Critique of the Teleological Power of Judgment, Kant is interested in real, objective purposiveness, namely, in natural teleology.

²⁵⁶ Initially, Kant examines the possibility that purposiveness or teleology may have been introduced into natural science through reflection either on the internal organization of certain objects (internal purposiveness) or on the usefulness of objects (relative or external purposiveness): “Experience leads our power of judgment to the concept of an objective and material purposiveness, i.e., to the concept of an end of nature, only if there is a relation of the cause to the effect to be judged, which we can understand as lawful only insofar as we find ourselves capable of subsuming the idea of the effect under the causality of its cause as the underlying condition of the possibility of the former. But this can

However, the problem seems to be that an object cannot be both natural and purposive, since purposiveness involves a type of causality that defies the standard natural causality. The standard natural causality of *nexus effectivus* (i.e. causal nexus of efficient causes) constitutes a one-way “descending” series of causes and effects, in which a later effect cannot bring about an earlier cause. Purposiveness, on the other hand, involves two-way causality, in which the cause and its effect mutually condition one another. This two-way causality, or *nexus finalis* (i.e. causal nexus of final causes), constitutes a series of both “descending” and “ascending” causal dependence.

Human craftsmanship provides a clear illustration of such two-way final causality. Kant’s example is that of building a house for the sake of profiting from the rent that will be paid for using it. In this case, the house and the rent can be considered reciprocally cause and effect of one another. On the one hand, building the house (and renting it) is the cause of the collected rent. On the other hand, the anticipated rent earned is what motivates one to build the house: “the house is certainly the cause of the sums that are taken in as rent, while conversely the representation of this possible income was the cause of the construction of the house” (CJ §65, 5:372-3). Note that the rent itself is not the efficient cause of the construction of the house. Rather, the

happen in two ways: either if we regard the effect immediately as a product of art or if we regard it only as material for the art of other possible natural beings, thus if we regard it either as an end or as a means for the purposive use of other causes. The latter purposiveness is called usefulness (for human beings) or advantageousness (for every other creature), and is merely relative; while the former is an internal purposiveness of the natural being” (CJ §63, 5:366-67; see also CJ §15, 5:226). He then argues that cases that supposedly exhibit relative purposiveness cannot license teleological judgments in natural science. In order to judge that a given object exhibits real external purposiveness, one needs to affirm not only that some other object is a means for the fulfillment of its purpose, but also that the fulfillment of the purpose of the given object is a genuine end of nature. The latter, however, cannot be confirmed empirically. Kant illustrates this point by examining the conditions that enable human habitation in northern regions. He maintains that even if certain conditions make these regions suitable for human beings, one cannot confirm that it was a genuine end of nature to lodge human beings there. In a manner similar to the example of the behavior of winds in tropical coasts in the pre-critical writings, Kant argues in this case that the conditions that make these areas habitable have natural causes and that they would remain the same even if these regions were not populated by human beings. One need not further invoke ends and purposes in order to explain these conditions. Thus, one cannot empirically confirm that the habitability of northern regions constitutes evidence of an external purposiveness pertaining to things themselves.

construction of the house was motivated by the representation of the rent and carried out in accordance with a representation of a suitable model of the house. Thus, *nexus finalis* in human craftsmanship involves intelligent intentions and planning.²⁵⁷ An intelligent agent, in whose mind the relevant representations arise, is thus part of the production of artifacts. This is what Kant means when he claims that final causality is a connection between *ideal* causes and their effects, while efficient causality is a connection between *real* causes and their effects.

Herein lies the gist of the difficulty at the heart of the Critique of the Teleological Power of Judgment. Although it seems that the absence of an external designer is what makes organisms *natural* objects, their *purposiveness* nevertheless appears to imply such a designer. We must therefore determine how organisms can be considered both natural and purposive. The problem becomes clear when one compares organisms with inanimate, natural objects and artifacts. Unlike inanimate, natural objects, organisms involve final causality, or what appears to be a plan or a blueprint. Unlike an artifact, an organism cannot have its cause in an external, rational agent. If organisms are supposed to be “products of nature,” rather than “products of art,” and if they are supposed to involve two-way final causality, this causality must somehow be real, not merely ideal. This would make organisms “ends of nature” or “natural purposes.” The worry is that the notion of “natural purpose,” which serves to conceptualize organisms, might involve a contradiction.²⁵⁸

²⁵⁷ McLaughlin (1990, pp. 38-39, 45) notes that Kant did not sharply distinguished between the intention, namely the “*causa finalis*,” on the one hand, and the plan, namely the “*causa formalis*,” on the other. He observes that despite this ambiguity, it is quite clear that it is the *causa formalis* (and not the *causa finalis*) that figures in Kant’s analysis of organisms.

²⁵⁸ This worry encapsulates the problem at the heart of the antinomy. In this respect, my interpretation differs from Ginsborg’s interpretation of Kant’s discussion of the teleological antinomy and analysis of organisms (especially as it is given in Ginsborg, 2004). Ginsborg recognizes two separate aspects of Kant’s view on organisms that correspond to two kinds of mechanical inexplicability. One aspect has to do with purposeiveness, while the other with naturalness. She then contends that only the first is relevant to the argument of the antinomy. In contrast, I argue that the combination of naturalness and

...in order to judge something that one cognizes as a product of nature as being at the same time an end, hence a **natural end**, something more is required if there is not simply to be a contradiction here. I would say provisionally that a thing exists as a natural end **if it is cause and effect of itself** (although in a twofold sense) (CJ §64, 5:370).

An organism can be a natural end if its purposiveness does not depend on an external designer, but is rather embodied in it. That is to say, an organism's organization cannot be the effect of an external agent. Instead, an organism must be the "cause and effect of itself." As Ido Geiger succinctly puts it, the claim that an object x is an organism has the general form " x produces itself."²⁵⁹

Kant points out three unique processes in organisms which demonstrate their distinctive feature of self-production: reproduction, growth, and self-maintenance. Through reproduction, a *species* of organisms generates itself and in this way is both a cause and effect of itself. An organism of a certain species is brought into being by another member of that same species, and it in turn produces another conspecific.²⁶⁰ In the process of growth, it is the *individual* organism that produces itself. Unlike the "increase in magnitude in accordance with mechanical laws" (CJ §64, 5:371), which amounts to attaching external additions to the body, in organic growth, an organism takes in materials from its surroundings, carefully processes and prepares them for its

purposiveness lies precisely at the heart of Kant's discussion. The unification of these two otherwise unproblematic notions gives rise to the troublesome concept of "natural end" and the teleological antinomy. Although we face no conceptual difficulties in comprehending natural phenomena such as wind and purposive artifacts such as clocks, we do face such difficulties in attempting to comprehend organisms, which are supposed to be natural purposes. We have numerous examples of inanimate phenomena and artifacts, but not of genuine natural purposes. See: "The concept of a causality through ends (of art) certainly has objective reality, as does that of a causality in accordance with the mechanism of nature. But the concept of a causality of nature in accordance with the rule of ends... can of course be thought without contradiction, but is not good for any dogmatic determinations, because since it cannot be drawn from experience and is not requisite for the possibility of experience its objective reality cannot be guaranteed by anything" (CJ §74, 5:397).

²⁵⁹ See Geiger, 2009, p. 541.

²⁶⁰ This idea dates back at least as far as Aristotle's famous statement that "man is born from man, but not bed from bed" (*Physics*, book 2, chapter 1, 193b8-9). Among philosophers of the modern period, Fontenelle offers a clear expression of this view (see Grene and Depew, 2004, p. 83).

use, and then develops itself by means of the processed materials.²⁶¹ Lastly, an organism produces itself in the sense that its parts maintain one another. The parts of an organism provide each other with materials essential for the growth and maintenance of the organism. Furthermore, if one part is damaged, the others will make up for it or even repair it in order to minimize the harm done to the proper function of the organism as a whole. Thus, each part provides for all the others, that is, for the whole organism, and each part depends on all the other parts or the whole organism for its preservation and proper functioning.²⁶² Kant claims that in addition to the fact that “each part is conceived as if it exists only **through** all the others, thus as if existing **for the sake of the others** and **on account of** the whole, i.e., as an instrument (organ),” each part is also “thought of as an organ that **produces** the other parts (consequently each produces the others reciprocally).” In other words, an organism is both organized and self-organizing, which is why it can “be called a **natural end**” (CJ §65, 5:373-374).

These organic processes illustrate the two-way causality characteristic of organisms, but they do not resolve the conceptual difficulties involve in the notion of a natural end. The parts of a natural end build and maintain one another and thus the organism as a whole, and they do so in a way that seems to aim at a particular end and in accordance with a plan or a program. The parts of a human embryo do not construct one another in an arbitrary fashion. The initial zygote develops itself into a

²⁶¹ Buffon seems to adopt a view of organic growth and decay centered on the mechanical addition and dissolution of organic parts. On his view, the parts of an organism have the same distinctive nature as the organism itself. Thus, generation and growth on the one hand, and death and decay on the other, are nothing but the addition and separation of organic parts, respectively (see Grene and Depew, 2004, pp. 84-85). Locke, on the other hand, in a way that anticipates Kant, takes the distinctive process of organic growth to be part of what he calls “common life,” which is what constitutes the identity of an organism in contrast to that of a mass of matter (*Essay* 2.27.3-4).

²⁶² Kant illustrates this point with the example of a tree. The leaves of a tree get water and salts essential to their functioning from the soil, through the roots, the trunk, and the branches. They depend, for their preservation, on these parts of the tree. Yet they also sustain these other parts by providing them with the sugars they produce in photosynthesis.

creature that will eventually have a form common to the members of its species. Furthermore, the parts balance and regulate one another and thereby assure the proper functioning of the whole organism. If one's airways are blocked, reducing the amount of oxygen entering the lungs, the heart pump will work harder to push more blood to the various parts of the body. The heart does this in order to compensate for the reduced amount of oxygen in the lungs and to ensure that the organs of the body will receive the oxygen essential to their proper functioning.

The question is how raw matter can assemble itself such that it acquires form and function of this kind. How do the crude, material parts of the human embryo "know" to build themselves into what will become a fully developed human organism? How can mere material parts of organisms regulate the function of the whole? There is no similar problem in the case of artifacts. Beds are not born from beds, and the parts of a bed do not have to "know" how to build and repair themselves. Beds are constructed and repaired by intelligent designers according to a plan of the complete bed. By contrast, one cannot assume that organisms have been designed by an external, intelligent agent, since this would imply that organisms are not natural objects, but rather products of art. Furthermore, matter itself cannot be regarded as intelligent, because that would imply the existence of "living matter," which, according to Kant, is contradictory (CJ §73, 5:394-95). It therefore seems that we cannot avoid conceiving of the growth and regular functioning of an organism except as guided by a plan or a concept of the whole organism, even though we do not know how to incorporate these concepts into a coherent, naturalistic view of living things.²⁶³

²⁶³ As we will see in the concluding section of this chapter, modern biology's important notion of a genetic program could suggest a reasonable way out of the puzzle. For a succinct discussion of the importance of genetic programs in modern biology, see Mayr, 2004, pp. 51-57.

In short, encountering organisms leads one to suspect that not every aspect of nature can be regarded as the outcome of mechanical processes. Such encounter therefore forces one, as it were, to admit that a different causal principle is effective, namely, final causality. However, the notion of a natural end, which captures the internal purposiveness of organisms, is problematic. This notion rejects intentional design of organisms, yet it remains unclear how the purposive features of organisms can arise by natural means.

6.3 The Antinomy of the Teleological Power of Judgment and Its Resolution

Kant maintains that the first stage in resolving the problem of teleology is stating it correctly. As we shall see in this section, he explains that the conflict between mechanism and teleology, properly conceived, is one between subjective maxims of explaining organisms, and not one between objective propositions concerning actual features of organisms. In Kant's technical terms, it means that the conflict consists in an antinomy of the power of judgment in its reflective use regarding regulative maxims, and not in an antinomy of the power of judgment in its determining use regarding constitutive principles. This implies that the principles of mechanism and teleology are not contradictorily opposed and, therefore, that they can be combined in the investigation of nature. In order to show that there is an antinomy in this case, Kant shows that both seemingly conflicting maxims are necessary due to the character of the human understanding.²⁶⁴ He completes the discussion of the antinomy by

²⁶⁴ Since an antinomy is a conflict between two necessary principles of reason, Kant must show that both maxims are necessary. Indeed, the teleological antinomy is a conflict between two maxims of the reflective power of judgment, and not of reason. Nevertheless, it is a conflict between two principles or

specifying the way in which the two maxims should be combined in the study of living phenomena.

Kant argues that the traditional doctrines of teleology have failed to cope with the challenge posed by organisms, and have thus failed to provide a satisfactory account of purposiveness in nature, because they have misconstrued the conflict between mechanism and purposiveness and have endorsed a dogmatic approach centered on attempts to establish whether there is purposiveness in nature.²⁶⁵ He classifies the traditional systems of teleology by means of two distinctions: a distinction between idealism and realism, and a distinction between physical and hyperphysical purposiveness. According to idealism, all apparent purposiveness in nature is “unintentional,” which means that there is no genuine purposiveness in nature. According to realism, on the other hand, there is “intentional” purposiveness in nature. The second distinction turns on the ground of natural purposiveness, and in particular whether it is inside or outside nature. Accordingly, there are four types of traditional teleological systems: physical idealism, like the Epicurean doctrine of

maxims of the intellectual faculty in the broader sense. It is not a conflict between an intellectual maxim and, say, an assertion grounded in the imagination or the senses. It is therefore important for Kant to emphasize that although an empirical encounter with organisms leads us to the teleological maxim, the necessity that this maxim embodies “cannot rest merely on grounds in experience, but must have as its ground some sort of *a priori* principle” (CJ §66, 5:376). Along these lines, we will also see that the concept of natural end is not derived from experience. Moreover, in the Dialectic of the Aesthetic Power of Judgment Kant gives a broader meaning to the term “dialectic.” In section 55, he explains that a dialectic consists in an opposition between propositions that are purportedly universal, and thus *a priori*. Insofar as the power of judgment advances propositions of this kind, it is “rationalistic,” and when such propositions conflict, a dialectic of the power of judgment arises. Thus, in the context of aesthetic judgment, neither an incompatibility between aesthetic judgments of sense concerning the agreeable and the disagreeable, nor a conflict between private judgments of taste of different individuals constitutes a dialectic. A dialectic in aesthetics therefore cannot be dialectic of taste itself. Rather, if there is to be dialectic in this context, it has to be dialectic of the *critique* of taste, which would have to do with conflicting propositions concerning the ground of the possibility of judgments of taste. Being universal and *a priori*, such propositions can generate an antinomy. Indeed, there is an antinomy in this context as well, since, in dealing with the critique of aesthetic judgment, conflicting propositions emerge “naturally and unavoidably.”

²⁶⁵ See CJ §72, 5:391.

accidentalism,²⁶⁶ hyperphysical idealism, such as the Spinozistic doctrine of fatalism,²⁶⁷ physical realism in the form of hylozoism,²⁶⁸ and hyperphysical realism or theism.²⁶⁹ This system of classification applies to Kant's pre-critical theories of teleology as well. The theory of the *Only Possible Argument* counts as hyperphysical realism, while the doctrine of the *Universal Natural History* may be regarded as a variant of physical idealism.²⁷⁰

²⁶⁶ Kant had already criticized the accidentalism of the classical atomists in the *Universal Natural History* and the *Only Possible Argument*. In the third *Critique*, he rejected it rather offhandedly. The atomists refer to blind chance to explain both mechanical and apparent teleological processes, and thereby eliminate the difference between them (CJ §73, 5:393). They use pure chance, by which atoms successfully meet, in order to explain the existence of the well-ordered material universe. Furthermore, they also use the accidental congregation of atoms to explain the origin of living creatures (see UNH 1:227, J 86). As we have seen, the young Kant maintained that order could not result from blind chance. Instead, the existence of order suggests that nature is dependent on a single, intelligent ground. Both contingent order, which exhibits signs of an intentional plan, and necessary order, which results from mechanical laws of motion, depend on God, though in different ways.

²⁶⁷ Unlike atomistic accidentalism, Spinozistic fatalism points to a single ground, which accounts for the apparent purposive order in nature. This ground is the Spinozistic substance, or the "original being." A unity of ground, however, is not sufficient. Purposiveness not only requires a single ground, but also an intelligent one (CJ §73, 5:393-94; See also CJ §80, 5:421). Yet, according to the Spinozistic doctrine, organisms (indeed, everything else as well) are not products of the "original being" through its understanding, but rather accidents necessarily inhering in it. In short, this is a system of strict natural necessity with no room for genuine purposiveness.

²⁶⁸ Physical realism affirms the existence of intentionally acting causes and assigns these causes to matter itself. This position thus amounts to hylozoism, which is based on the contradictory concept of living matter.

²⁶⁹ Hyperphysical realism (i.e. theism) also affirms the existence of intentionally acting causes, but unlike physical realism, it ascribes them to a supernatural ground. The problem with hyperphysical realism is that it lacks the theoretical resources required to confirm its claims. Nevertheless, among all the dogmatic approaches to teleology, Kant favors the theistic approach, since theism "among all the grounds for explaining [teleology] has the advantage that by means of the understanding that it ascribes to the original being it can best rid the purposiveness of nature of idealism and introduce an intentional causality for its generation" (CJ §73, 5:395). Kant's preference for theism fits with the idea that the notion of teleology may imply a transition from natural philosophy to theology and ethicotheology. In the closing sections of the *Analytic of the Teleological Power of Judgment*, Kant moves from considering organisms and particular features of nature to considering nature as a whole (see Geiger, 2009, pp. 543-48). Kant argues that the notion of final causality in organisms leads us to the idea of the whole of nature as a system of ends (CJ §67). Teleology can thus be considered a transition or propaedeutic to practical philosophy and theology, and in particular to ethicotheology (CJ 5:170; §68, 5:383; §75, 5:399; §79, 5:417). For further discussion, see Guyer, 2006, pp. 335-59.

²⁷⁰ The theory of the *Only Possible Argument* counts as hyperphysical realism, since it claims that purposive natural arrangements are intentionally instituted by God. That is, it ascribes the source of purposiveness to the supernatural ground of nature, namely, God. The doctrine of the *Universal Natural History* is a variant of physical idealism (though not of accidentalism), insofar as it locates the basis of apparent purposiveness in the inner structure of matter. If one takes Kant's efforts to ascribe the order found in nature to the "first cause" of nature into consideration, the doctrine of the *Universal Natural History* may be categorized as hyperphysical idealism, since, as we have seen, the "first cause" identified in the *Universal Natural History* is not an intentionally acting agent, but rather something like a world-plan embedded in nature or a "cosmic DNA."

Kant claims that all these traditional systems of teleology, including his own pre-critical doctrines, “want to explain our teleological judgments about nature” (CJ §73, 5:392) but fail because they approach the task dogmatically. That is, they attempt to furnish this explanation by determining whether organisms actually possess purposive features. This strategy is problematic because we are not in a position to demonstrate the “objective reality” of the concept of a thing as a natural end, namely, to show “that an object is possible in accordance with such a principle” (CJ §74, 5:396). As Kant puts it, “not merely can it not be determined whether or not things of nature, considered as natural ends, require for their generation a causality of an entirely special kind (that in accordance with intentions), but this question cannot even be raised, because the objective reality of the concept of a natural end is not demonstrable by means of reason at all” (ibid.).

The objective reality of the concept of a natural end cannot be established for the following reason. First, the concept involves conflicting requirements. *Qua* natural, a natural end is supposed to be a product of “natural necessity.” *Qua* end, it cannot be entirely determined by natural laws of matter alone. Therefore, in order to avoid a contradiction, one must exclude the purposive aspects of a natural end from nature and refer them to “something that is not empirically cognizable nature” or a “supersensible” agent (CJ §74, 5:396). That is to say, one avoids a contradiction by assigning natural (mechanical) necessity and purposiveness to separate realms. The former is ascribed to nature, while the latter is thought to pertain to the supersensible ground of nature. In this way, one can think of the notion of a natural end without a contradiction, but one cannot show its objective reality, since the concept of the supersensible ground of nature cannot be drawn from experience and is not a condition for experience. Consequently, the notion of natural end is only

“problematic” (CJ §74, 5:397).²⁷¹ In short, the concept of natural end is either contradictory or problematic, and in either case it cannot figure in objective judgments concerning natural things. Therefore, the conflict between mechanism and teleology cannot be construed as one between objective claims about actual features of natural things.

In Kantian terminology, this means that the conflict between mechanism and teleology, properly conceived, does not constitute an antinomy of the determining power of judgment. In its determining use, the power of judgment determines actual objects and events, and thus generates objective assertions about natural things, but as we have just seen, the conflict between mechanism and teleology cannot be construed as one between objective claims. Furthermore, the power of judgment in its determining use determines actual objects and events by subsuming them under concepts and principles provided by the understanding. It has no principles of its own, and thus cannot generate an antinomy. Therefore, if there is an antinomy of the power of judgment, it can only involve the power of judgment in its reflective use, since in this use, the power of judgment is an autonomous source of maxims which serve to guide the investigation of objects.²⁷² Indeed, an antinomy does arise between the following two regulative maxims of the reflective power of judgment.

²⁷¹ Kant also demonstrates that the concept of a natural end cannot be derived from experience by stressing that teleological judgments involve claims concerning how things *ought* to be. Organisms involve a concept or a plan which determines their growth and function. This concept determines, as it were, how the organism ought to develop. There seems to be a concept that determines the goal toward which the parts of a natural end ought to develop themselves. And just as the moral ought cannot be derived empirically, so the teleological ought cannot be drawn from experience: “A teleological judgment compares the concept of a product of nature as it is with one of what it **ought to be**. Here the judging of its possibility is grounded in a concept (of the end) that precedes it *a priori*. There is no difficulty in representing the possibility of products of art in such a way. But to think of a product of nature that there is something that it **ought to be** and then to judge whether it really is so already presupposes a principle that could not be drawn from experience (which teaches only what things are)” (CJ FI 20:240).

²⁷² See CJ §69, 5:385-86; 5:179-81.

The **first maxim** of the power of judgment is the **thesis**: All generation of material things and their forms must be judged as possible in accordance with merely mechanical laws.

The **second maxim** is the **antithesis**: Some products of material nature cannot be judged as possible according to merely mechanical laws (judging them requires an entirely different law of causality, namely that of final causes) (CJ §70, 5:387).

As in the case of the antinomy in the first *Critique*, we are naturally and unavoidably led to dogmatically construe this opposition as a conflict between objective claims concerning actual features of things. Indeed, it is natural to suppose that if we must investigate objects by means of mechanical principles, then objects themselves must evolve in a purely mechanical manner. And it is just as natural to suppose that if we must explain certain things in purposive terms, then they must possess purposive features.²⁷³ A critique is therefore required in this case as well. The critique shows first that the conflict should be properly understood as an antinomy of the reflective judgment, and thus that mechanism and teleology are not contradictory, and second that both mechanism and teleology, properly conceived as maxims of the reflective judgment, are necessary due to the “special character” of our understanding.

²⁷³ In a manner similar to the Dialectic in the first *Critique*, Kant maintains in the Dialectic of the Teleological Power of Judgment that we are naturally led to understand the conflict dogmatically as one between objective assertions. In the Dialectic in the first *Critique*, Kant maintains that the transcendental illusion of reason is natural and unavoidable because “in our reason (considered subjectively as a human faculty of cognition) there lie fundamental rules and maxims for its use, which look entirely like objective principles, and through them it comes about that the subjective necessity of a certain connection of our concepts on behalf of the understanding is taken for an objective necessity, the determination of things in themselves” (A297/B353). Similarly, in the Dialectic of the Teleological Power of Judgment, Kant talks about “special characteristics of our cognitive faculty... which we may easily be misled into carrying over to the things themselves as objective predicates” (CJ §77, 5:405). Thus, we tend to transform the above-stated subjective maxims into two conflicting objective assertions, namely, that all generation of material things is mechanical, and that the generation of some material things is not mechanical. However, one must overcome the temptation to read the subjective maxims in this way, since our methodological maxims say nothing about objects themselves. In particular, the fact that we are obliged to use a teleological maxim in the investigation of certain natural phenomena does not license us to infer that there is genuine purposiveness in nature or that there is a rational designer of nature. On this point, see Geiger, 2009, pp. 542-43.

Concerning the first point, Kant maintains that if one understands the conflict as one between objective propositions, one is led to a contradictory opposition, since, as such, the conflict consists of the claims that everything evolves mechanically and that some things cannot evolve in a purely mechanical manner. Furthermore, this opposition would be unresolvable, since reason can establish neither proposition. On the other hand, mechanism and teleology, as maxims of the reflective judgment, are not contradictory, but can rather fit together in the investigation of nature. The maxim of mechanism instructs us to investigate natural objects by means of mechanical principles “as far as one can,” and this allows one to appeal to the maxim of teleology “on the proper occasion,” namely, when one investigates organisms (CJ §70, 5:387-88). Thus, the maxim of mechanism does not rule out the appeal to the maxim of teleology, and the appeal to the maxim of teleology on the proper occasion does not undermine the requirement that one proceed in the mechanical mode of investigation as far as one can. In this way, Kant takes the first step toward the reconciliation of naturalness and purposiveness, which eluded him in the pre-critical accounts of the problem.

The second task of the critique is to demonstrate not only that mechanism and teleology *can* fit together in the investigation of nature, but also that they *necessarily* figure in this investigation, since an antinomy is a conflict between necessary principles. In his analysis of “the special character of the human understanding” (CJ §77) Kant intends to complete the discussion of the antinomy by demonstrating that the regulative maxims of mechanism and teleology are necessary due to the “special character” of our understanding.²⁷⁴ This analysis evokes two features peculiar to the

²⁷⁴ Accordingly, transforming mechanism and teleology into regulative maxims of the reflective power of judgment is not enough for the completion of the discussion of the antinomy of the teleological power of judgment. As the title of section 71 indicates, this move is only the “preparation” for the

human understanding: that it must proceed from universal concepts to particular things and that it must proceed from parts to the whole.

The human understanding is a discursive intellect or a faculty of concepts. That is to say, it proceeds from universal concepts to particular things given in intuition, or more specifically, by subsuming particular things under universal concepts and general principles. We conceptualize particular phenomena by means of the concepts and principles of the understanding. Put differently, a concept of a particular phenomenon maps the parts and features of that phenomenon. The concept, however, provides only a limited layout of the intuited particular. Our concepts suffice to identify objects in certain circumstances, but they never fully grasp the entire concrete particularity of individual phenomena. Even empirical concepts, which draw a more detailed picture of phenomena than the pure concepts of the understanding, do not provide a complete characterization. Kant expresses this by claiming that there is an element of contingency in the correspondence between our concept and the relevant particular.²⁷⁵

Since our concepts only partially map objects, we always proceed from the parts mapped to the whole, which contains other features not yet explored. Indeed, this is a feature peculiar not only to human reason, but in general to “any finite reason that is similar to ours in quality” (CJ §77, 5:409). Finite reason proceeds from the

resolution of the teleological antinomy. Regardless of the differences in their interpretation of Kant’s argument in the *Dialectic*, several recent commentators have recognized that the antinomy is not resolved simply by turning it into a conflict of regulative maxims. Some of them provide a list of earlier writers who argued that the resolution of the antinomy consists in attributing regulative, as opposed to constitutive, status to the principles of mechanism and teleology. See McFarland, 1970, pp. 120-21; Zumbach, 1984, p. 142, note 23; McLaughlin, 1990, pp. 137-40; Allison, 1991, pp. 25, 29-30, 39 (note 1); Greene and Depew, 2004, pp. 112-14; Ginsborg, 2004, p. 36, note 5; Guyer, 2006, p. 346; Geiger, 2009, pp. 546-47.

²⁷⁵ See: “Our understanding thus has this peculiarity for the power of judgment, that in cognition by means of it the particular is not determined by the universal, and the former therefore cannot be derived from the latter alone; but nevertheless this particular in the manifold of nature should agree with the universal (through concepts and laws), which agreement under such circumstances must be quite contingent and without a determinate principle for the power of judgment” (CJ §77, 5:406-07).

incomplete knowledge of certain parts of the object to an investigation of the whole. This feature of the human understanding is more crucial in the investigation of organisms than in studying inanimate phenomena. Our partial knowledge and characterizations of things do not, for the most part, prevent us from understanding inanimate phenomena. This is so because the parts and features that do figure into our characterizations of inanimate phenomena suffice for the comprehension of how they come into being and how they evolve.²⁷⁶ When investigating living phenomena, on the other hand, we cannot simply proceed from the parts to the whole, since we regard living phenomena as things in which the parts and the whole reciprocally depend on one another. In this case, then, knowledge of the parts depends on knowledge of the whole. But since we never have an empirical characterization of the whole, in its entirety, an investigation of a given organism must proceed on the basis of a *representation* of the whole organism.

In short, we must employ the maxim of mechanism, since according to the special character of our understanding we must explain things as the outcome of the properties and forces of their parts, which is just what it means to explain things mechanically.²⁷⁷ Whereas in the *Universal Natural History* and the *Only Possible Argument* the methodological instruction to extend the mechanical mode of explanation as far as possible simply followed from an assumption as to what is more philosophical, in the third *Critique*, Kant grounds this instruction in the peculiar

²⁷⁶ Recall Kant's favorite example of wind behavior in tropical coasts. One need not have complete concepts of the air, sea, and land in these specific areas in order to explain this phenomenon. It suffices that one knows that the land heats up and cools down faster than the sea and how this fact influences the processes by which various subsections of the air decrease and increase in density.

²⁷⁷ See: "if we consider a material whole, as far as its form is concerned, as a product of the parts and of their forces and their capacity to combine by themselves (including as parts other materials that they add to themselves), we represent a mechanical kind of generation" (CJ §77, 5:408); "it is entirely contrary to the nature of physical-mechanical causes that the whole should be the cause of the possibility of the causality of the parts, rather the latter must be given first in order for the possibility of a whole to be comprehended from it" (CJ FI 20:236).

nature of the human understanding. As Kant puts it, “[i]n accordance with the constitution of our understanding... a real whole of nature is to be regarded only as the effect of the concurrent moving forces of the parts” (CJ §77, 5:407). We must also employ the maxim of teleology, since, when investigating an organism, our inability to empirically grasp wholes forces us to appeal to a representation of the whole organism, which is just what it means to explain by means of final causality.²⁷⁸

... since the whole would in that case be an effect (**product**) the **representation** of which would be regarded as the **cause** of its possibility, but the product of a cause whose determining ground is merely the representation of its effect is called an end, it follows that it is merely a consequence of the particular constitution of our understanding that we represent products of nature as possible only in accordance with another kind of causality than that of the natural laws of matter, namely only in accordance with that of ends and final causes (CJ §77, 5:408).

Kant’s analysis of the special character of the human understanding thus shows that the regulative maxims of mechanism and teleology are necessary in the investigation of organisms. This means that in such investigations, we must find a way to combine the maxim of mechanism, which instructs us to explain objects in terms of the properties and forces of their parts, with the maxim of teleology, which instructs us to regard organisms as objects in which each part has an essential function in the whole and in which nothing is in vain.²⁷⁹ Kant maintains that the two should be combined in

²⁷⁸ These features may not be uniquely peculiar to the human understanding. As was noted above, they may also be applicable to other finite understandings that are “similar to ours in quality” (CJ §77, 5:409). However, there is at least one conceivable understanding, to which these features do not apply, namely, an intuitive understanding. An intuitive understanding is not constrained to move from universals to particulars and from parts to wholes. It rather directly grasps the whole particular organism in its entirety. In its representation of the whole “there is no **contingency** in the combination of the parts, in order to make possible a determinate form of the whole” (CJ §77, 5:407). Allison maintains that the point of Kant’s contrast of our discursive understanding with an intuitive understanding is to stress that the peculiar manner in which we investigate organisms reflects a merely subjective necessity, and that it, therefore, cannot be taken as indicating anything with respect to things themselves (Allison, 1991, pp. 36-37).

²⁷⁹ See: “**An organized product of nature is that in which everything is an end and reciprocally a means as well.** Nothing in it is in vain, purposeless, or to be ascribed to a blind mechanism of nature” (CJ §66, 5:376); “in an organized being nothing that is preserved in its procreation should be judged to be nonpurposeful” (CJ §80, 5:420).

the following way: whenever we discern a purpose or function in an organism, we should mechanically investigate the means by which the function in question is served. This is what Kant means when he claims that the maxim of mechanism has to be “subordinated” to that of teleology.

For where ends are conceived as grounds of the possibility of certain things, there one must also assume means the laws of the operation of which do not **of themselves** need anything that presupposes an end, which can thus be mechanical yet still be a cause subordinated to intentional effects. Hence even in organic products of nature, but even more if, prodded to do so by their infinite multitude, we assume that intentionality in the connection of natural causes in accordance with particular laws is also (at least as a permissible hypothesis) the **universal principle** of the reflecting power of judgment for the whole of nature (the world), we can conceive a great and even universal connection of the mechanical laws with the teleological ones in the productions of nature, without confusing the principles for judging it with one another and putting one in the place of the other, because in a teleological judging of matter, even if the form which it assumes is judged as possible only in accord with an intention, still its nature, in accordance with mechanical laws, can also be subordinated as a means to that represented end (CJ §78, 5:414).

In sum, the transition from the *Universal Natural History* and the *Only Possible Argument* to the third *Critique* marks a shift from a dogmatic to a critical approach to the problem of teleology. The dogmatic version of the conflict presents us with a dilemma between contradictory claims, specifically, the claim that everything happens mechanically, and the claim that some objects in nature (i.e. organisms) are created by an intelligent designer. Affirming the former entails renouncing the purposive character of organisms, while affirming the latter implies rejecting their natural character. The problem is that both the purposive and the natural character of organisms are essential elements of our conception of them and, furthermore, that

reason can establish neither of the conflicting claims, since both involve the problematic notion of natural end. By contrast, in the third *Critique*, Kant interprets the conflict between mechanism and teleology as one that constitutes an antinomy of the reflective power of judgment between two subjective maxims for explaining organisms. His analysis demonstrates not only that mechanism and teleology, understood in this way, are not contradictory, but also that the character of human understanding makes it necessary for us to combine them in the investigation of living phenomena.

6.4 Kant's Conception of Life Sciences: Objections and Replies

In light of recent advances in biology, one can attack Kant's analysis of living phenomena in the Critique of the Teleological Power of Judgment from two opposite perspectives. The force of these criticisms becomes clearest when one encapsulates Kant's view of life sciences in the following two propositions: (1) in explaining living phenomena, one cannot rely on mechanical principles alone, but must also appeal to teleological principles; consequently, (2) since the mechanical mode of explanation is the only properly scientific type of explanation, one cannot regard the investigation of living phenomena as proper science. Some modern biologists and philosophers object to the first proposition on the grounds that biological phenomena, which Kant held could only be explained with the help of teleological principles, can in fact be explained in an entirely mechanical manner. This objection is encouraged by the progress made in the science of biology from Kant's time to the present, especially in the fields of molecular biology and genetics. According to this view, biology is reducible to the physical sciences and, therefore, deserves the status of "proper science." On the other hand, there are thinkers who reject the claim that biology is

reducible to or a branch of the physical sciences. They nevertheless contend, *contra* Kant, that it is a genuine science. Although they may agree with Kant's general claim that biology differs from physics in essential respects, they challenge his attempt to remove biology from the realm of proper science. In response, I suggest that Kant's analysis of living phenomena reveals biology's uniqueness in much the same way as several current theorists do. Furthermore, I maintain that Kant's reluctance to consider biology a proper science is not a consequence of his critical philosophy, but rather of his inability to construe the unique features of biology in natural terms, which results from the fact that he lacked an appropriate conceptual framework, such, for example, as the one provided later by modern biology. I suggest that Kant's analysis of living phenomena is intriguing and much more relevant to present views of the discipline than may seem at first glance.

Paul Guyer voices the first of the two objections stated in the previous paragraph. He maintains that contemporary scientists could reject Kant's argument for teleology because it turns on organic processes, which can in fact be understood by means of "our ordinary mechanical model of causation."²⁸⁰ According to contemporary scientists, the processes of reproduction, growth, and organism maintenance, which Kant invoked to elucidate his notion of an "end of nature," can be explained by the powers of the parts of organisms. Even if we currently lack mechanical explanations of each and every element of these processes, "contemporary scientists proceed in the confidence that 'mechanical' answers to these questions will be found."²⁸¹ They are also confident that they will find mechanical, evolutionary explanations for the existence of the mechanical bases of organic processes. Finally, modern scientists

²⁸⁰ Guyer, 2006, p. 342.

²⁸¹ *Ibid.*

would also reject Kant's teleological maxim, which instructs us to regard organisms as objects in which each part has an essential function in the whole.

... although one might be tempted to say that contemporary scientists surely accept Kant's view that every part of an organism serves some function in the systematic life of the whole, although unlike Kant they are confident that a mechanical explanation of both the origination and the activity of every part of an organism can at least in principle be found, even that assumption may be indefensible: Stephen Jay Gould long argued that the mechanism of natural selection can carry along all sorts of non-functional by-products or "spandrels" that are mechanically connected with functional and selected traits, as long as those spandrels are not *dysfunctional*, that is, as long as they do not compromise the reproductive success of the organism; or traits can be carried along that were adaptive for an organism in an old environment but are no longer adaptive in a new or changed environment, as long as they are not too dysfunctional. These possibilities are reflected in contemporary genomics in the idea of stretches of "junk DNA" in chromosomes, by-products of past evolution, that can be carried along with the currently vital stretches of DNA as long as they do not harm the organism, that is, again, reduce the probability of its reproductive success. So even as a regulative principle the idea that every part of an organism is a vital and valuable part of it as an internally purposive system seems doubtful.²⁸²

Furthermore, contemporary biologists and philosophers of science and biology would probably reject Kant's second proposition that life sciences are not proper sciences. Kant postulates strict physicalist criteria for sciences. On his view, a field of investigation counts as science, properly speaking, to the extent that it proceeds by means of mechanical reasoning and is formulated mathematically.²⁸³ Since chemistry,

²⁸² Guyer, 2006, pp. 342-43.

²⁸³ For assertions of the mechanical criterion of proper science, see: "It is of infinite importance to reason that it not allow the mechanism of nature in its productions to drop out of sight and be bypassed in its explanations; for without this no insight into the nature of things can be attained" (CJ §78, 5:410); "if it is not made the basis for research then there can be no proper cognition of nature" (CJ §70, 5:387); "We can and should be concerned to investigate nature, so far as lies within our capacity, in experience, in its causal connection in accordance with merely mechanical laws: for in these lie the true

biology, and psychology do not satisfy these criteria, Kant did not consider them proper sciences.

By contrast, contemporary scientists and philosophers of science do not doubt that biology is a genuine science, primarily because of how the discipline has developed since Charles Darwin's *On the Origin of Species* (1859). Francisco J. Ayala claims that Darwin's greatest accomplishment was that "he brought the design aspects of nature into the realm of science. The wonderful designs of myriad plants and animals could now be explained as the result of natural laws manifested in natural processes, without recourse to an external Designer or Creator."²⁸⁴ Ernst Mayr criticizes the attempt to identify science with physics, which has led to the downgrading of biology. He accuses Kant of being one of the prominent thinkers who entrenched the physicalist view of science.

Physics with a mathematical foundation became the exemplar of science for Galileo, Newton, and all the other greats of the Scientific Revolution. This physicalist interpretation dominated the thinking of the philosophers of science. And this remained so for the next three hundred fifty years. Curiously, it was quite generally ignored in discussions of science in those centuries that there were now also other sciences. Instead, these other sciences were squeezed into the conceptual framework of physics. Mathematics remained the earmark of true science. Kant certified this opinion by saying "there is only that much genuine [*richtig*] science in any science, as it contains mathematics." And this greatly exaggerated evaluation of physics and mathematics has dominated science until the present day. What would be the scientific status of Darwin's

physical grounds of explanation, the interconnection of which constitutes scientific cognition of nature through reason" (CJ FI 20:235). See also CJ §80, 5:418. The clearest expression of the mathematical criterion of proper science appears in the *Metaphysical Foundations of Natural Science*: "in any special doctrine of nature there can be only as much *proper* science as there is *mathematics* therein" (MF 4:470).

²⁸⁴ Ayala, 2000, p. 287. Ayala explains that Darwin's work was a further step in the scientific revolution which originated in Copernicus. The Copernican revolution consisted in adopting the belief that the universe is governed by natural laws that account for natural phenomena. Copernicus, Galileo, and Newton demonstrated that this was the case in the inanimate world, while Darwin completed the revolution by applying this view to the living world as well (see Ayala, 2000, pp. 285-87).

Origin of Species (1859), which contains not a single mathematical formula and only a single phylogenetic diagram (not a geometric figure) if Kant had been right?²⁸⁵

In response to these objections, we may first note that what is at stake is largely the question of whether biology is reducible to physics and that this issue is far from being decided.²⁸⁶ This, as a first step, wards off Guyer's objection. Guyer seems to squeeze present-day biologists into a homogeneous group of contemporary scientists who unanimously proceed in the confidence that all living phenomena can in principle be explained mechanically, in a manner characteristic of the physical sciences. It seems, however, that there is no unanimity on this issue.²⁸⁷ Moreover, Mayr and Ayala are clear examples of biologists and philosophers of science who argue for the autonomous status of biology. In fact, for Mayr, it is precisely those processes of reproduction, growth, and maintenance, which Guyer claims contemporary scientists regard as capable of being explained in physical terms, that mark the essential difference between living and inanimate phenomena, much as they did for Kant:

²⁸⁵ Mayr, 2004, p. 14. On Mayr's view, the roots of the physicalist view of science lie in the fact that at the origin of philosophy of science, advances were primarily made in the physical sciences of mechanics and astronomy. This led philosophers to take it for granted that all the different sciences were in effect modeled after physics.

²⁸⁶ Clark Zumbach likewise maintains that the central philosophical issue in the Critique of the Teleological Power of Judgment is the question of reductionism, that is, "of whether living phenomena are reducible to highly complex, highly special patterns of physical processes" (Zumbach, 1984, p. 6). Geiger similarly argues that "to break the hold of Kant's argument, it would be necessary to purge our language of concepts the internal form of which implies self-organization. This would mean the *actual* disintegration or dissolution of biology into physics and chemistry" (Geiger, 2009, p. 543).

²⁸⁷ In a recent book, entitled *Contemporary Debates in Philosophy of Biology*, the first subject debated is the question "is it possible to reduce biological explanations to explanations in chemistry and/or physics." Evelyn Fox Keller and John Dupré provide the contributions to this debate, which respectively bear the titles "It Is Possible to Reduce Biological Explanations to Explanations in Chemistry and/or Physics" and "It Is Not Possible to Reduce Biological Explanations to Explanations in Chemistry and/or Physics." See also the editors' introduction to this section. For a list of other modern philosophers of science and biology who argue for "the rehabilitation of teleology against its reductivist critics," see Schönfeld, 2000, p. 273, note 75.

Owing to their complexity, biological systems are richly endowed with capacities such as reproduction, metabolism, replication, regulation, adaptedness, growth, and hierarchical organization. Nothing of the sort exists in the inanimate world.²⁸⁸

In light of the second objection, which targets Kant's view that the investigation of living phenomena is not proper science, Kant's theory of life sciences may seem outdated. One might argue that Kant's discussion of the subject is shortsighted and limited by the state of the sciences of his days. Nevertheless, it seems to me that much can be said in favor of Kant's position, precisely in connection with this objection. I maintain that Kant advanced a non-reductivist view of the life sciences that is similar to several present-day theories of biology. What prevented him from considering biology a genuine science is mainly that he lacked the theoretical resources to construe the essential, non-mechanical features of his theory of organisms as *natural* factors. Kant was unable to see how the representation or plan of the whole organism, which he thought was necessary in order to produce a satisfactory account of organisms, could be conceptualized without recourse to an intelligent designer. By contrast, the mechanistic mode of explanation seemed perfectly natural. I suggest that Kant regarded it as a necessary condition of proper science because it was the only purely natural mode of explanation available to him. Mechanism in the sense in which Kant uses it in the third *Critique* does not follow from the constitutive conditions of our experience.²⁸⁹ It rather stems from "the special character of the human

²⁸⁸ Mayr, 2004, p. 29.

²⁸⁹ In particular, the regulative maxim of mechanism of the third *Critique* does not follow from and is not identical with the transcendental principle of causality of the first *Critique*. According to the transcendental principle of causality, "Everything that happens (begins to be) presupposes something which it follows in accordance with a rule" (A189); "All alterations occur in accordance with the law of the connection of cause and effect" (B 232). This implies the existence of a general connection of cause and effect. Mechanism, on the other hand, adds specific content to this connection of cause and effect, namely, that the whole is the effect of the properties and forces of its parts.

understanding,” namely, precisely that character that necessitates the teleological principle as well.²⁹⁰

Kant insisted on considering organisms natural. He maintained that the fact that we are obliged to attribute purposive features to them does not license us to infer that they are the product of the intentional action of an external designer.²⁹¹ This constitutes a substantial shift from his earlier view in the *Only Possible Argument*, according to which the purposive features of the organic world are directly instituted by God. In the third *Critique*, Kant makes a clean break from this view, despite the fact that he does not have an alternative naturalistic account of the purposive aspects that we ascribe to organisms. In particular, he could not find a way to explicate the notions of plan and function in natural terms. As we will now see, future advances in the life sciences show that Kant’s emphasis on the role of plans and functions in these sciences was on the mark. They also show how Kant’s worry can be settled, namely, how to explicate plans and functions in natural terms. I will consider, in sequence, Mayr’s discussion of the notion of plans in the organic world and Ayala’s analysis of the role of function in biological explanations.

Kant, we have seen, maintains that the representation or the plan of the whole organism is essential to any account of a living phenomenon. He argues that the appeal to such plans differentiates living from inanimate phenomena. Like inanimate phenomena, living phenomena observe the physical laws of nature. But, unlike

²⁹⁰ Ido Geiger (2009) defends Kant’s claim concerning the necessity of the teleological judgment in a different, more comprehensive manner. On Geiger’s account, the Analytic and the Dialectic of the Teleological Power of Judgment contain two independent arguments for the necessity of teleological judgments. The Analytic advances an argument that departs from an analysis of our judgments in biology. This argument could affect Kant’s contemporaries, since it was universally acknowledged in his time that a conflict between mechanism and teleology arises in the investigation of organisms. In the Dialectic, on the other hand, one finds a more general argument, according to which teleological judgments are not only necessary in biology, but also in our empirical experience and research of nature as a whole.

²⁹¹ See CJ §65, 5:373-74; §74, 5:397.

inanimate phenomena, we conceive of them as evolving in accordance with a certain plan. Modern biology elucidates Kant's idea in natural terms by means of the notion of "genetic programs." A program, according to Mayr, is a

*coded or prearranged information that controls a process (or behavior) leading it toward a goal. The program contains not only the blueprint of the goal but also the instructions for how to use the information of the blueprint. A program is not a description of a given situation but a set of instructions.*²⁹²

In a manner similar to Kant, Mayr maintains that being controlled by plans or programs differentiates living and inanimate processes. As Mayr explains,

all biological processes differ in one respect fundamentally from all processes in the inanimate world; they are subject to *dual causation*. In contrast to purely physical processes, these biological ones are controlled not only by natural laws but also by *genetic programs*. This duality fully provides a clear demarcation between inanimate and living processes.²⁹³

Mayr regards dual causality as "perhaps the most important diagnostic characteristic of biology."²⁹⁴ He stresses that programs are essential to living phenomena and that borrowing "the term program from informatics is not a case of anthropomorphism."²⁹⁵ Genetic programs are the product of evolution and can be rendered entirely naturally in terms of the DNA of the genome.²⁹⁶

²⁹² Mayr, 2004, p. 53.

²⁹³ Ibid., p. 30.

²⁹⁴ Ibid.

²⁹⁵ Ibid., p. 55.

²⁹⁶ Mayr notes that the idea of a plan poses a problem for the physics-oriented philosopher of science, but not for the biologist: "Accepting the concept of program seems to cause no difficulties to a biologist familiar with genetics or to any scientist familiar with the working of computers. However, programs... do not exist in inanimate nature. Traditional philosophers of science, familiar with only logic and physics, therefore have had great difficulty in understanding the nature of programs" (Mayr, 2004, p. 53).

Kant's claim that we have to construe organisms as objects involving mutual dependence of parts and wholes is also reflected in the current concept of "downward causation." John Dupré uses this notion to signify causation acting from a system on its constituent parts. He employs it to defend the thesis that biology is not reducible to the sciences of physics and chemistry, and in particular, that "the properties of constituents cannot themselves be fully understood without a characterization of the larger system of which they are part." He concentrates on organic systems at the molecular level, and not only at the level of the whole organism, as Kant does.²⁹⁷

Modern biology also shows how to naturalize the second purposive feature in Kant's account, namely, the appeal to function in biological explanations. Kant's teleological maxim instructs us to assume that nothing in an organism is in vain and to look for the function of each and every part in the life of the organism. For Kant, this constitutes a further characteristic that demonstrates the uniqueness of biology and its irreducibility to physics. Francisco Ayala similarly considers teleological and functional explanations both indispensable for biology and constitutive of its autonomous scientific status.

I will propose that biology is distinct from the physical sciences in that it uses patterns of explanation, and makes recourse to laws, that do not occur in, nor can be reduced to, those formulated in the physical sciences. Specifically, I shall seek to show that teleological explanations constitute patterns of explanation that apply to organisms while they do not apply to any other kind of objects in the natural world. I shall further claim that although teleological explanations are compatible with causal accounts, they cannot be reformulated in

²⁹⁷ Dupré, 2010, pp. 32, 42-43.

nonteleological language without loss of explanatory content. Consequently, I shall conclude that teleological explanations cannot be dispensed with in biology.²⁹⁸

In a manner similar to Kant, Ayala draws an analogy between natural teleology and means-end human activity. The analogy exposes both the similarities and the differences between the two cases. As in Kant's discussion, the difference is that in artificial teleology, the object is produced by an external designer, whereas in natural teleology, the design or functional features of organisms come about by natural processes.²⁹⁹ For Kant, the notion of an end of nature is problematic precisely because it involves both the design aspects of organisms and the necessity of explaining their generation in terms of natural processes, while a suitable conceptual framework that would account for the natural generation of the design aspects was missing.

Ayala maintains that Darwin's principle of natural selection provides the missing framework in the following way. Structures, organs, and behaviors of organisms are said to be teleological when they serve a certain function or are directed toward certain ends. Ayala offers the examples of birds' wings, whose function is to enable flying, eyes, which are used for seeing, and kidneys, which regulate the composition of blood. To explain a certain feature teleologically means to show that this feature exists because it contributes to a certain property of the system. Birds have wings *because* wings enable birds to fly, and human beings have eyes *because* eyes enable human beings to see. Ultimately, wings and flying, and eyes and seeing, are adaptations that have come about *because* they increase the reproductive success of

²⁹⁸ Ayala, 2000, p. 283. Regarding those who deny teleology, Ayala remarks: "It is in any case amusing to read statements of denial of teleology in articles and books pervaded with teleological language and teleological explanations. One is reminded that 'a rose by any other name is still a rose.' It has been informally attributed to one or another distinguished evolutionist, the witticism: 'Teleology for a biologist is like a mistress. A man does not want to be seen in her company, but he cannot do without her'" (ibid., p. 298, note 21).

²⁹⁹ Ibid., p. 302.

their carriers. “It is in this sense,” Ayala summarizes, “that the ultimate source of teleological explanation in biology is the principle of natural selection.”³⁰⁰ He further argues that teleological explanations are, at least to some extent, empirically testable hypotheses, that teleological and causal explanations are fully compatible, and that the fact that the evolution of organisms involves stochastic events does not imply that their features are not teleological.³⁰¹

In sum, these considerations show that Kant’s theory of the living world is actually not so far removed from certain contemporary views that consider biology an autonomous, proper science. Regarding the autonomy of biology, we have seen that on Kant’s view the investigation of living phenomena essentially differs from and is irreducible to the physical sciences. Concerning the scientific status of biology, I have suggested that Kant’s reluctance to regard it as proper science is mainly due to his inability to construe teleological features in natural terms. His rigid mechanistic criterion for science does not follow from the constitutive conditions of cognition propounded in his critical philosophy. Rather, the necessity of appealing to mechanical explanations stems from a special feature of our human understanding, which also necessitates an appeal to teleological principles in the investigation of organisms. Therefore, acknowledging the status of biology as a genuine science does

³⁰⁰ Ibid., p. 300. See also Mayr, 2004, pp. 31-32.

³⁰¹ Ayala’s ideas may also enable us to reply to Guyer’s objection that, *contra* Kant’s teleological maxim, not every part of an organism makes an essential contribution to the well-being of the whole. According to Ayala, there are several ways in which the features of organisms may relate to function. An organism may have (1) features which have arisen by natural selection due to their usefulness and which are still useful, (2) features which have arisen by natural selection due to their usefulness but have lost their usefulness and are now neutral to the reproductive fitness, (3) features that have come about as incidental consequences of other features that are useful and are now neutral to the reproductive fitness, and (4) features that have come about as incidental consequences of other features that are useful and which have become functional over time. In all these cases, either the origin of the feature under discussion or its preservation, or both, are explained by reference to a certain function. Accordingly, we can modify Kant’s maxim in the following way: in the explanation of a certain feature of an organism, look for the relevant function. Even if a feature is not useful and did not directly result through natural selection, its connection to a certain function may explain its presence. Geiger (2009, p. 538) suggests that in CJ §66, 5:377 Kant indeed qualifies his maxim in this way.

not require any significant modification to his critical philosophy. In other words, Kant's critical philosophy is consistent with a more liberal, wider view of science. Furthermore, I maintain that if recent advances in biology and in the philosophy of biology – the conceptualization of the idea of design without designer in terms of genetic programs, the understanding that two-way and downward causality does not involve “causation from the future” and is thus compatible with the second analogy,³⁰² and the formulation of teleological explanations in terms of natural selection – had been available to Kant, he probably would not have refused to consider biology proper science. Indeed, Kant agrees with present-day supporters of the view that biology is an autonomous, genuine science in claiming that living phenomena develop in accordance with a plan, that certain unique processes distinguish them from the inanimate world, that despite the fact that living phenomena manifest functional features, they should be studied empirically and without appeal to an external designer, that one should conceive of living phenomena as systems that involve “downward causation” (i.e. as natural ends), and that teleological explanations are indispensable to the investigation of living phenomena. In fact, the course of development Kant follows from his dogmatic approach in the pre-critical accounts, which construed naturalness and purposiveness as contradictory, to the critical view in the third *Critique*, which unified these two features in a coherent view of living phenomena, testifies that he was *en route* to the modern view of life sciences as autonomous discipline.³⁰³

³⁰² See McLaughlin, 1990, pp. 152-53. This point has been further reinforced by biologists who have shown that there is no conflict between causal and teleological explanations, since the latter involve no mystical backward causation from the future. See Ayala, 2000, pp. 304-06; Mayr, 2004, p. 61.

³⁰³ Michael Ruse, while acknowledging Kant's essential contribution to the progress toward modern biology, likens Kant to Moses: “Like Moses, [Kant] was never to enter the promised land – Israel for the one, evolution for the other – but he did lead us to the borders” (Ruse, 2006, p. 415).

Afterword

In this dissertation, I have investigated the role of the antinomy in Kant's intellectual development. This aspect of Kant's work has not been sufficiently addressed in the literature. This deficiency is particularly noteworthy when one recalls Kant's claims that the antinomy is the "most remarkable phenomenon" of reason, that "it works the most strongly of all to awaken philosophy from its dogmatic slumber, and to prompt it toward the difficult business of the critique of reason itself" (P §50, 4:338), and that it was the "the antinomy of pure reason...that...first aroused me from my dogmatic slumber and drove me to the critique of reason itself, in order to resolve the scandal of ostensible contradiction of reason with itself" (letter to Garve, October 1798, 12:257-58).

I have argued that studying the antinomies in view of the general opposition between the mathematical and metaphysical approaches to nature and tracing their roots in the pre-critical texts have significant merits. First, such a study contributes to our knowledge of Kant's intellectual development, and does so by focusing on an essential feature of his critical philosophy, namely, the antinomy of pure reason. Furthermore, it provides a more accurate assessment of the Dissertation's central position in the critical turn and a deeper understanding of the analyses of the antinomies in the first and third *Critiques*. It also sheds light on the relevance of Kant's resolution of the antinomies to current work in metaphysics and philosophy of science.

I have stressed the key role that the antinomies played in motivating the central position of the Dissertation and in the transition from Kant's dogmatic position in the

pre-critical texts to his critical position in the *Critique of Pure Reason* and the *Critique of the Power of Judgment*. I have shown that in the Dissertation Kant began to analyze the conflicts regarding the size and composition of the world in a more abstract and systematic manner, and that the unsatisfactory solution suggested by the Dissertation's doctrine of the separation between the sensible and the intelligible worlds propelled Kant to reevaluate his position and eventually to develop his transcendental idealism. I have tried to put forward a defensible interpretation of this transition, and to the extent that my interpretation is cogent, it provides further support for the two perspective reading of transcendental idealism. We have also seen that the lesson learned from Kant's resolution of the antinomies is to no small extent effective in guarding against current dogmatic tendencies as well. Indeed, some of Kant's claims and arguments, which have often been rejected as obsolete in light of recent advances in the sciences, are still relevant and in fact deeper and more intriguing than has previously been allowed.

I have considered first the conflict which constitutes the second antinomy, namely the conflict concerning the composition and divisibility of the world, since it more clearly instantiates the development of Kant's thinking on the opposition between the two general approaches to nature which lies at the heart of Kant's discussion of the antinomy. The investigation of Kant's analyses of the problem of divisibility from the pre-critical texts, through the Dissertation, and up until the *Critique* reveals a series of attempts to untie the conflict between the mathematical and metaphysical approaches and elucidates how his understanding of the empirical world gradually evolved. Ultimately, this investigation accounts for Kant's critical reinterpretation of the dogmatic principles that fueled the pre-critical version of the conflict (i.e. that space is a condition of external objects and that composites consist of simples). This

reinterpretation is an essential part of Kant's resolution of the antinomy and of his new metaphysics of experience.

Kant resolves both mathematical antinomies in the first *Critique* by rejecting the underlying presupposition that the empirical world is a thing in itself, and thus that it has determinate size and composition. In particular, this result has an important implication for current cosmology. In view of modern cosmology, Kant's resolution of the first antinomy appears outdated to some. Modern cosmological theories, after all, do suggest that the world evolved from a singular point by a big bang or through a cycle of successive expanding and contracting phases. However, we have seen that the resolution of the first antinomy does not reject the legitimacy of the cosmological project of explaining the current state of the universe and its evolution in terms of earlier events in the history of the world. Instead, it shows that modern theories are misguided only insofar as they attempt to affirm that the singular point is the absolute beginning of the world or that the cycle of expansion and contraction is ultimately infinite. By doing so, they ascribe a determinate size to the world, while the world, properly taken as a phenomenon, has no determinate size. Thus, Kant does not deny science a legitimate avenue of research. He rather keeps cosmology from sliding into the dogmatic paths of old.

The analysis of the problem of living phenomena and the conflict between mechanism and teleology sheds further light on the development of Kant's conception of nature. In this case as well, the transition from dogmatic views regarding teleology, which center on attempts to verify objective claims concerning the teleological features of organisms, to a critical approach to the problem, which construes the problem as one concerning modes of explanation of organisms, has proven fruitful. Here too reinterpreting the objective propositions of the pre-critical version of the

conflict as regulative maxims, along with locating them properly in the map of experience, paved the way toward a resolution of the problem. Kant's resolution of the antinomy of the teleological power of judgment successfully combines mechanism and teleology in a rich and intriguing view of organisms and life sciences. In response to current objections to Kant's view of life sciences, I have stressed the ways in which it anticipated future developments in biology and in the philosophy of biology. I have claimed that the conceptual problems with which Kant struggled attest more to the relevance and depth of his insights, than to the shortcomings of his view.

In agreement with the claim of a Kant scholar that "Kant himself is incomparably his own best commentator,"³⁰⁴ in this study, I have tried to substantiate Kant's assertion that the antinomy of pure reason first aroused him from his dogmatic slumber and drove him to the critique of reason. The study shows that the roots of the antinomies are found in the pre-critical analyses of the same conflicts discussed in the *Critiques*. It advances a reading of the Dissertation as a milestone in the development of Kant's thinking on these conflicts. Finally, the study shows how Kant's resolutions of the antinomies in the first and third *Critiques* enrich our understanding of his conception of nature and emphasizes that the deep lessons they teach are relevant to current natural sciences as well. In this research, I have focused on the antinomies that directly pertain to Kant's conception of nature, namely, the mathematical antinomies of the *Critique of Pure Reason* and the teleological antinomy of the *Critique of the Power of Judgment*. Future studies may trace an analogous course of development of Kant's thought with respect to the dynamical antinomies, which concern the problem of freedom and the existence of a necessary being and, therefore, have practical and theological implications.

³⁰⁴ Paton, 1936, vol. 1, p. 19.

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אוניברסיטת תל-אביב

הפקולטה למדעי הרוח ע"ש לסטר וסאלי אנטין

בית הספר לפילוסופיה

האנטינומיות ותפיסת הטבע של קאנט

חיבור לשם קבלת התואר "דוקטור לפילוסופיה"

מאת

עידן שמעוני

בהנחיית מרסלו דסקל וירון סנדרוביץ'

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להורי, רות ועמיקם שמעוני

תקציר

קאנט הצהיר בכמה הזדמנויות שהאנטינומיה היא התופעה המעניינת והמוזרה ביותר של התבונה האנושית, ושהיא זו שהעירה אותו מתרדמתו הדוגמטית והניעה אותו לקראת ביקורת התבונה.¹ בעבודה זו ברצוני להציג ניתוח של האופן שבו התעצבה תפיסת הטבע של קאנט לאור התפתחות מחשבתו על אודות האנטינומיה של התבונה. אבקש בה להתחקות אחר האנטינומיה, החל מן השלבים המוקדמים של התקופה הקדם-ביקורתית ועד לביקורת התבונה הטהורה ולביקורת כוח השיפוט.

פרשנים הדגישו לאחרונה את החשיבות של החיפוש אחר שורשי הפילוסופיה הביקורתית בכתבים המוקדמים של קאנט, ואולם על אף שקריאתם זכתה להתייחסות מחקרית רבת היקף, עדיין חסר בספרות דיון שיטתי בתפקיד של האנטינומיה במפנה הביקורת. עיונים בשורשים ההיסטוריים של האנטינומיה מתמקדים בעיקר בדיונים של פילוסופים שקדמו לקאנט ושעסקו בקונפליקטים הדומים לאלה המוצגים באנטינומיות. יתרה מזאת, מחקרים שאכן מחפשים את שורשי האנטינומיה בטקסטים של קאנט, מתחילים לרוב מהדיסרטציה (1770) ומתעלמים מדיונים חשובים בהקשר זה שמופיעים בטקסטים מוקדמים יותר, ככל הנראה בשל הנטייה להתמקד באנטינומיה הראשונה.

בחינה שיטתית של התפתחות מחשבתו של קאנט על האנטינומיה מן הכתבים הקדם-ביקורתיים ועד לתקופה הביקורתית מעלה יתרונות לא מבוטלים. ראשית, היא מאירה את התפתחות תפיסת הטבע של קאנט לאור מרכיב יסודי של הפילוסופיה הביקורתית, כלומר, האנטינומיה. שנית, היא מבהירה את חשיבות הדיסרטציה כציון דרך מרכזי במפנה הביקורתי ומובילה לפרשנות מדוייקת יותר של טקסט זה. שלישית, בחינה זו שופכת אור על הטענות של קאנט בפרק על האנטינומיה בביקורת, ומראה שהם אינם בלתי מתיישבים עם מגמות עכשוויות במטאפיזיקה ובפילוסופיה של המדע. אולם, יש להבהיר שקאנט לא מפרט את הטעמים שהובילו אותו משלב לשלב של התפתחותו. הקורא נדרש לשחזר את מהלך מחשבתו של קאנט על אודות האנטינומיה ולזהות לבדו את שלבי התפתחותה. מטרתי בעבודה זו אינה רק לתאר את השלבים

¹ ראה ביקורת התבונה הטהורה (ירושלים: מוסד ביאליק, 1954), A407/B434; הקדמות לכל מיטאפיזיקה בעתיד שתוכל להופיע כמדע (ירושלים: מאגנס, 1957), §§ 50, 52, עמ' 142, 145; מכתב מקאנט לכריסטיאן גארבה, אוקטובר 1798, 257-58. ההפניות בתקציר זה לביקורת התבונה הטהורה הן לפי העימוד במהדורה הראשונה (A) והשנייה (B) של הביקורת. ההפניות להקדמות הן לתרגום העברי של הספר. הפניות ליתר הכתבים הן לפי העימוד של כתבי קאנט בעריכת האקדמיה הגרמנית למדעים (Kants Gesammelte Schriften, edited by the German Academy of Sciences, Berlin: Walter de Gruyter, 1900-).

השונים הללו, אלא להציע טיעון בר הגנה בדבר מהלך ההתפתחות והמעבר משלב לשלב. בטיעון זה בדבר מהלך התפתחות מחשבתו של קאנט אני מפרש את האידיאליזם הטרנסצנדנטלי של קאנט לאור הגישה הפרשנית שנקראת גישת "שתי נקודות המבט", וכך יש בעבודתי גם משום מתן תימוכין עקיף לגישה פרשנית זו.²

העובדה שהאנטינומיה היא התופעה המעניינת ביותר של התבונה האנושית ושהיא השומרת היעילה ביותר נגד נסיגת התבונה להאמנות דוגמטיות באה לידי ביטוי בכך שיסודה של האנטינומיה באשליה "דו-צדדית". כלומר, האנטינומיה היא סוג של אשליה שבה אנו מובלים באופן טבעי ובלתי-נמנע לנסח תשובות מנוגדות לכמה שאלות בדבר אספקטים שונים של העולם. סידרת השאלות והתשובות המנוגדות להן משקפות ניגוד יסודי בין שתי גישות שונות להבנת הטבע. קאנט מציג את הניגוד הזה בפרק על האנטינומיה ב*ביקורת כניגוד שבין שיטת אפלטון ושיטת אפיקורוס*. בהקשר של הדיון באנטינומיות, הגישה הראשונה מנסה לבסס את התיזות שטוענות כי העולם מוגבל בהתפשטותו בחלל ובזמן; שהוא מורכב מחלקים פשוטים; שיש פעולות חופשיות בעולם; ושקיים יש הכרחי. הגישה השנייה מנסה לבסס את האנטיטיזות שטוענות שהעולם הוא אינסופי; שאין בו ישים פשוטים; שהכול מתרחש באופן הכרחי בהתאם לחוקי טבע; ושלא קיים יש הכרחי.

בעבודה זו אכנה את שתי הגישות המנוגדות האלה הגישה "המטאפיזית" והגישה "המתמטית" בהתאמה, כפי שקאנט עצמו קורא להן במקומות אחרים שלא זכו כאן להתייחסות. הגישה המטאפיזית מתבוננת בעולם מנקודת המבט של היחס שבין השלם לחלקיו. היא רואה את העולם כמערכת של עצמים ומבקשת לשלב בהסברו שיקולים קונצפטואליים ועקרונות מטאפיזיים. הגישה המתמטית היא בעלת אוריינטציה מדעית. היא מבקשת לחקור את העולם באופן אמפירי ולהסבירו באופן מכני במונחים של חומר ותנועה בחלל.

הניגוד בין שתי הגישות האלה נמצא בכתבי קאנט החל מראשית דרכו. עיון בכתבים הקדם-ביקורתיים מגלה שהוא הושפע משתי גישות חשובות ויסודיות אלה באשר להבנת עולם הטבע, ואף התלבט ביחס לתוקפן. בחלק מהכתבים המוקדמים קאנט טען לטובת טענותיה של הגישה האחת, ובחלק לטובת טענותיה של הגישה היריבה. בכתבים הקדם-ביקורתיים קאנט אף הציג תשובות מנוגדות לשאלות בדבר גודלו וחליקותו של העולם.

² הספרות הפרשנית נחלקת בין שתי גישות פרשניות עיקריות בנוגע לאידיאליזם טרנסצנדנטלי ולהבחנה שבבסיסו בין תופעות ודברים כפי שהם לעצמם. הגישה האחת נקראת גישת "שני העולמות" והיא מפרשת את ההבחנה באופן אונטולוגי כהבחנה בין שני סוגים שונים של מושאים. הגישה השנייה נקראת גישת "שתי נקודות המבט" (ולעיתים, גישת "שני ההיבטים") והיא מפרשת את ההבחנה באופן מתודולוגי או אפיסטמולוגי כהבחנה בין שתי נקודות מבט פילוסופיות שלאורך אנו מתבוננים במושאים. במסגרת מחקר זה, אין בכוונתי להיכנס לפרטי מחלוקת פרשנית זו ואין בכוונתי לנסות ולהציע לה פיתרון.

הניסיון לפתור את הקונפליקטים בין טענות שתי הגישות האלה הוא אחד המניעים העיקריים לעמדה המרכזית שקאנט מציג בדיסרטציה, כלומר, תיזת ההפרדה. תיזה זו טוענת להפרדה בין שני מימדים שונים של הממשות: העולם המושכל המוכר דרך השכל ועולם התופעות המוכר דרך החושים. עמדה זו מאפשרת לקאנט לקבל את טענות שתי הגישות באופן הבא: טענותיה של הגישה המטאפיזית באשר לגודלו ולחליקותו של העולם חלות על העולם המושכל, בעוד שטענותיה של הגישה המתמטית חלות על עולם התופעות. כלומר, תיזת ההפרדה מאפשרת לקאנט לטעון שהעולם המושכל סופי ומורכב מחלקים פשוטים, בעוד שעולם התופעות אינסופי וניתן לחלוקה אינסופית.

אולם דרך התמודדות זו עם הקונפליקט נכשלת, שכן על אף העמדה הרשמית של קאנט בדיסרטציה, מדיונו בחיבור, כך אראה, מתברר שעולם התופעות אינו נפרד לחלוטין מהעולם המושכל. על אף הניסיון להפריד בין שני מימדי הממשות, קאנט אינו יכול להימנע מההכרה שעולם התופעות האמפירי מכיל אלמנטים או עקרונות של העולם המושכל. כתוצאה מכך, הוא הבין כי דבריו בדיסרטציה עדיין מחייבים אותו לטענות מנוגדות בדבר גודלו וחליקותו של עולם התופעות. עולם התופעות נתפס מצד אחד בהתאם לתנאים החושיים כאינסופי וכניתן לחלוקה אינסופית, ומצד שני בהתאם לעקרונות המושכלים כסופי וכמורכב מחלקים פשוטים.

סיטואציה זו היא שהובילה את קאנט לבחינה יסודית וביקורתית של אופן ההתבוננות שלנו בעולם ובאובייקטים. אני טוען שלכך הוא התכוון, כשאמר שהאנטינומיה העירה אותו מתרדמתו הדוגמטית.

ביקורת התבונה הטהורה קאנט מגיע למסקנה שהפתרון לקונפליקט בין הגישה המתמטית והגישה המטאפיזית כרוך בהתבוננות חדשה בעולם הטבע. הקונפליקטים בדבר גודלו של העולם וחליקותו נפתרים אם מבחינים בין שתי דרכים להתבונן בעולם: כתופעה וכפי שהוא לעצמו. להתבונן בעולם כתופעה פירושו להתבונן בו בכפוף לתנאי ההכרה החושית (זהו המובן הביקורתי והחדש של העולם כתופעה). להתבונן בעולם כפי שהוא לעצמו פירושו להתבונן בו באופן בלתי תלוי בתנאים אלה וכך כמושא הנתון ל"שכל טהור". קאנט טוען שניתן לומר שלעולם יש גודל מסויים (כלומר, שהוא סופי או שהוא אינסופי) ושיש לו הרכב מסויים (כלומר, שהוא מורכב מחלקים פשוטים או שהוא מורכב מסידרה אינסופית של חלקים בתוך חלקים), רק אם מתייחסים אליו כאל דבר כפי שהוא לעצמו. אם, לעומת זאת, מחשיבים אותו כתופעה, לא ניתן לייחס לו גודל והרכב מסויימים. מנקודת מבט זו, אם כן, הניגוד בין הגישה המטאפיזית והגישה המתמטית הופך להיות "ניגוד דיאלקטי" בלבד. כלומר, אם מתבוננים בעולם כתופעה, אזי

הטענות המנוגדות בדבר גודלו והרכבו מתבררות כולן כשגויות, משום שהם מבקשות לקבוע טיבן של תכונות מסויימות של העולם (גודלו והרכבו) בשעה שזו טעות קטגוריאלית לייחס לעולם התופעות תכונות כאלה.

הבחנה זו בין שתי דרכי ההתייחסות לעולם היא תמצית האידיאליזם הטרנסצנדנטלי. פיתרון האנטינומיה באמצעות הבחנה זו של האידיאליזם הטרנסצנדנטלי בין תופעות ודברים כפי שהם לעצמם היא בבחינת הוכחה עקיפה לתוקפו של האידיאליזם הטרנסצנדנטלי שהוצג בחלקים המוקדמים יותר של *הביקורת*. הבחינה החדשה של קאנט של אופני ההתבוננות בעולם מציגה מטאפיזיקה של הניסיון שבה עקרונות היסוד של שתי הגישות המתחרות מפורשים מחדש ומשובצים במקומם המתאים במפת הניסיון וההכרה.

בעבודה זו אני מבקש להדגים את המהלך הכללי הזה מהכתבים הקדם-ביקורתיים, דרך הדיסרטציה, ועד *הביקורת* על ידי דיון באנטינומיות הקשורות באופן ישיר לתפיסת הטבע של קאנט. כלומר, העבודה תתמקד באנטינומיות המתמטיות הנידונות ב*ביקורת התבונה הטהורה*. את הדיון באנטינומיות הדינמיות, העוסקות בשאלת החופש ובשאלת קיומו של יש הכרחי ושיש להן השלכות אתיות ותיאולוגיות, אותיר להזדמנות אחרת. כמו כן, העבודה תעסוק גם באנטינומיה של כוח השיפוט הטלאולוגי המופיעה ב*ביקורת כוח השיפוט*. זאת על מנת להציג נדבך נוסף של הקונפליקט בין הגישה המתמטית והגישה המטאפיזית בתקופה המוקדמת ושל המודיפיקציה שהן עוברות במסגרת המטאפיזיקה של הניסיון בתקופה הביקורתית.

התפתחות מחשבתו של קאנט על אודות הניגוד היסודי בין הגישה המטאפיזית והגישה המתמטית להבנת הטבע ניכרת לעין במיוחד אם מתמקדים באנטינומיה השנייה, במקום, כפי שנהוג, באנטינומיה הראשונה. לפיכך, בחרתי להתמקד בקונפליקט הנידון באנטינומיה השנייה, כלומר, בקונפליקט בדבר הרכבו וחליקותו של העולם. לאחר הפרק הראשון שמציג את המבוא לעבודה, הפרקים השני והשלישי עוסקים בקונפליקט בדבר הרכבו של העולם. הפרק השלישי בוחן את הדיון הקדם-ביקורתי בקונפליקט זה. קאנט זיהה את שאלת החליקות כבעיה יסודית שמהווה סלע מחלוקת בין הגישה המטאפיזית והגישה המתמטית כבר בחיבור *מונדולוגיה פיזיקלית* (1756). בחיבור זה קאנט מציג מודל דינמי של חומר שאמור לפתור את הקונפליקט. הוא יוצא מנקודת המבט של הגישה המטאפיזית ומתבונן בגופים חומריים לאור היחס שבין גוף חומרי מורכב לבין חלקיו. על פי מודל זה, גוף חומרי מורכב מעצמים פשוטים שמפעילים כוחות של משיכה ודחייה זה על זה. התכונות הפיזיקליות והחלליות של הגוף נובעות מפעולת הכוחות האלה. קאנט טוען שגוף חומרי מורכב מחלקים פשוטים, ויחד עם זאת, שאת החלל שהגוף ממלא

ניתן לחלק באופן אינסופי (לא ניתן להרחיק את החלקים האלה זה מזה, אלא רק להבחין ביניהם).

המודל הדינמי של החומר של קאנט כרוך אפוא בתפיסה יחסית של חלל. החלל והתכונות החלליות, על פי תפיסה זו, נגזרים מאינטרקציה בין הדברים החומריים. לכן, כאשר קאנט מאמץ, בהתאם לעמדתה של הגישה המתמטית, תפיסה של חלל מוחלט כתנאי לקיום החומר ולמבנה שלו בחיבור *כיוונים בחלל* (1768), נוצר קונפליקט בתורת הטבע שלו. מצד אחד, המודל הדינמי של החומר גורס שהחומר מורכב מחלקים פשוטים. ומצד שני, תפיסת החלל המוחלט מקפלת בתוכה את הטענה שהחומר ניתן לחלוקה אינסופית. קאנט מנסה כאמור לפתור את הקונפליקט בדיסרטציה על ידי ההפרדה בין העולם המוחש לעולם המושכל. כישלון תיזת ההפרדה מניע אותו לפתור את הקונפליקט בדבר הרכב העולם באופן ביקורתי באנטינומיה השנייה כפי שהוסבר לעיל. הדיון של קאנט באנטינומיה השנייה נבחן בפרק השלישי של המחקר.

הפרקים הרביעי והחמישי עוסקים בקונפליקט הנידון באנטינומיה הראשונה, כלומר בקונפליקט בדבר גודלו של העולם בחלל ובזמן. במחקרי אני מתמקד בהתמודדות של קאנט עם שאלת גודלו של העולם בזמן, כלומר, השאלה האם לעולם יש התחלה בזמן או שמא הוא נצחי. הפרק הרביעי בוחן את הטיפול הקדם-ביקורתי בשאלה זו. בניגוד לשאלת הרכב העולם, שאלת גודלו של העולם לא נראתה לקאנט בתחילה כמהווה בעייה שמפרידה בין הגישה המטאפיזית והגישה המתמטית. הוא זיהה את השאלה כבעייתית רק בדיסרטציה.

קודם לדיסרטציה, קאנט סבר שניתן לדון בצורה מספקת בשאלה הקוסמולוגית בדבר גודלו של העולם באמצעות שיקולים מטאפיזיים או על ידי הסברים מכניסטיים. קאנט הציג הסברים שונים של העולם *מזהרה חדשה* (1755), *בתולדות הטבע הכלליות* (1755) ו*בטעם האפשרי היחיד* (1763). *מזהרה חדשה* קאנט בוחן את העולם מנקודת המבט של הגישה המטאפיזית, *בתולדות הטבע הכלליות* הוא חוקר את העולם מהפרספקטיבה של הגישה המתמטית, ו*בטעם האפשרי היחיד* הוא מנסה לשלב את שתי נקודות מבט. על אף העובדה שמכל אחד מהדיונים האלה משתמעת תשובה שונה לשאלת גודלו של העולם, קאנט בכל זאת מאמץ את תשובתה של הגישה המטאפיזית, שלפיה יש לעולם התחלה בזמן, ומתעלם מעמדת הגישה המתמטית, שלפיה העולם נצחי.

בדיסרטציה קאנט מבחין לראשונה בכך ששאלת גודלו של העולם מציבה בעייה. הוא מנתח את המושג "עולם" באופן כללי וטוען שהוא מכיל דרישה לשלמות של החלקים שמהם מורכב העולם. לפי ההגדרה של קאנט בדיסרטציה, העולם הוא מערכת שלמה ומקיפה של דברים,

כלומר, מערכת שאינה יכולה להיות חלק ממערכת מקיפה יותר. דרישה זו לשלמות הופכת את המושג "עולם" לבעייתי, משום שהיא יכולה להתפרש בדרכים מנוגדות בהתאם לעקרונות מושכלים או בהתאם לעקרונות חושיים. מחד, התבונה תובעת לחשוב על העולם כעל סופי, מצד שני תנאי ההכרה החושית דורשים לדמות את העולם כמתפשט בחלל ובזמן אינסופיים.

תיזת ההפרדה של הדיסרטציה אמורה היתה לפתור קונפליקט זה, וכישלונה גרם לקאנט להבין שנדרשת דרך שונה לגמרי להתבונן בעולם. על פי הפיתרון המוצע על ידי תיזת ההפרדה, טענתה של הגישה המטאפיזית בדבר גודלו הסופי של העולם חלה על העולם המושכל, וטענתה של הגישה המתמטית בדבר עולם אינסופי אמורה לחול על עולם התופעות. פיתרון זה כאמור נכשל משום שמהדיון של קאנט בדיסרטציה עולה כי עולם התופעות אינו נפרד לחלוטין מהעולם המושכל. כתוצאה מכך קאנט הבין כי דבריו בדיסרטציה עדיין מחייבים אותו לטענה והיפוכה ביחס לגודלו של העולם, ושעליו לפתור את הבעיה בדרך אחרת. הבעיה נפתרת בדיון באנטינומיה הראשונה *בביקורת התבונה הטהורה* באמצעות ההבחנה של האידיאליזם הטרנסצנדנטלי בין תופעות לדברים כפי שהם לעצמם. לטענת קאנט, כאשר משקיפים על העולם כעל תופעה, הקונפליקט הופך לניגוד דיאלקטי, שכן במקרה זה אין לעולם גודל מסוים. לכן, הוא אינו יכול להיות בעל גודל סופי או בעל גודל אינסופי. הדיון של קאנט באנטינומיה הראשונה מנותח בפרק החמישי של המחקר.

דיונו של קאנט בשאלת גודלו של העולם באנטינומיה הראשונה הוא בעל השלכה מעניינת הנוגעת לקוסמולוגיה באופן כללי. מסקנת הדיון היא שלעולם אין גודל מסויים, ולכן הניסיון לקבוע באופן מוחלט אם לעולם יש התחלה בזמן או אם העולם נצחי הוא מוטעה, בין אם זה נעשה באופן מטאפיזי ובין אם באופן מדעי. הטעות אינה נעוצה בכך שהניסיון לקבוע את גודלו של העולם באופן מוחלט מתיימר להכריע בדבר שאלה שאין בידינו מידע או נתונים אמפיריים הנדרשים לצורך מענה עליה, אלא בכך שהוא מניח שלעולם יש גודל מסויים. הנחה זו היא טעות קטגוריאלית, שכן כפי שהראה הניתוח של קאנט באנטינומיה, לא ניתן לייחס לעולם כתופעה גודל מסויים. הטענה אפוא אינה שהמדע אינו יכול להכריע בשאלה האמפירית בדבר גודלו של העולם, אלא שהשאלה בדבר גודלו המוחלט של העולם אינה שאלה אמפירית, אלא בעייה טרנסצנדנטלית שדורשת פיתרון ביקורתי. הקוסמולוגיה, אם כן, רשאית לחקור מאורעות קדומים בהיסטוריה של העולם, ואף להניח מצב ראשוני שממנו התפתח היקום כפי שאנו מכירים אותו כיום, אך היא חורגת משדה מחקרה בשעה שהיא מנסה לקבוע דבר-מה מוחלט על אודות מצב ראשוני זה.

הפרק השישי והאחרון עוסק באנטינומיה של כוח השיפוט הטלאולוגי הנידונה בביקורת כוח השיפוט. בעיית הטלאולוגיה מורכבת משתי שאלות הקשורות זו לזו: האם הטבע מתפתח באופן מכני בלבד או שמא יש בו גם סיבתיות תכליתית; והאם ניתן באופן עקרוני להסביר את כל תופעות הטבע באופן מכני, או שמא נדרש לפנות גם לעקרונות הסבר טלאולוגיים. הגישה המתמטית טוענת שבטבע שוררת סיבתיות מכנית בלבד ושניתן להסביר את הטבע באופן מכני לגמרי, בעוד שהגישה המטאפיזית בהקשר זה מדגישה שבטבע יש גם סיבתיות תכליתית ושיש לפנות גם לעקרונות הסבר תכליתיים. הבעיה עולה במלוא חומרתה בדיון ביצורים חיים.

תולדות הטבע הכלליות הטעם האפשרי היחיד מציגים בתקופה הקדם-ביקורתית תשובות מנוגדות לבעיית הטלאולוגיה. הספר *תולדות הטבע הכלליות* מאמץ את הגישה המתמטית ומשתמעת ממנו התפיסה שהטבע פועל באורח מכני גמור ושניתן להסביר את כל תופעות הטבע, לרבות יצורים חיים, באופן מכניסטי. לעומת זאת, הספר *הטעם האפשרי היחיד* מאמץ בהקשר של הדיון ביצורים חיים את נקודת המבט של הגישה המטאפיזית וטוען שיצורים חיים אינם מתפתחים באופן מכני גמור ושאלוהים התערב בעיצובם. לכן, לא ניתן להסביר יצורים חיים באופן מכני בלבד. מהדיון הקדם-ביקורתי בבעיית הטלאולוגיה משתמע אפוא שטבעיות ותכליתיות מוציאים זה את זה. אימוץ גישה נטורליסטית בנוגע לאופיים ולהיווצרותם של יצורים חיים שוללת את האפשרות לייחס להם מאפיינים תכליתיים, בעוד שהכרה במאפיינים התכליתיים שלהם גוררת מתכנן חיצוני, ובכך מערערת את מעמדם כיצורים טבעיים.

בביקורת כוח השיפוט קאנט טוען שיש לזנוח את דרך הטיפול המסורתית הדוגמטית בבעיית הטלאולוגיה. הדרך הדוגמטית, כמו זו של קאנט בכתבים הקדם-ביקורתיים, מנסה לפתור את הבעיה על ידי הצעת פיתרון לשאלה האובייקטיבית האם יש סיבתיות תכליתית בטבע. לעומת זאת, בביקורת כוח השיפוט קאנט טוען שיש להבין את הקונפליקט בין מכניזם וטלאולוגיה כקונפליקט בין שני כללים סובייקטיביים החיוניים להסבר תופעות הטבע. הבנה כזו של מכניזם וטלאולוגיה פותחת פתח לתיאוריה של יצורים חיים שמשלבת באופן פורה הן את היותם יצורים טבעיים והן את המאפיינים התכליתיים שאנו מייחסים להם. אבקש לטעון במחקר שפיתרון זה של האנטינומיה הטלאולוגית מצביע על כך שתפיסתו של קאנט את מדעי החיים עמוקה יותר מכפי שנדמה במבט ראשון, ושהיא עולה בקנה אחד עם תפיסות עכשוויות שמדגישות את המעמד של הביולוגיה כמדע לגיטימי ועצמאי.

מבנה העבודה המתואר לעיל משקף את התיזה המרכזית שלי, כלומר, את הטענה שלאנטינומיה היה תפקיד ממשי וחיוני בהתפתחות הפילוסופיה של קאנט, ובפרט, בהתפתחות

תפיסת הטבע שלו. במחקרי אבקש לבסס תיזה זו על ידי הסבר התגבשות תפיסת הטבע של קאנט לאור התפתחות מחשבתו על האנטינומיה, החל מן השלבים המוקדמים של התקופה הקדם-ביקורתית ועד לביקורת התבונה הטהורה וליקורת כוח השיפוט.