

## 康德之力的概念： 經驗論者或理性論者？

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### 摘 要

本論文探討康德對於力的說明。這個題目在康德所處的時代中，位於哲學關懷的核心地位，但在他的各種《批判》裡，他卻沒有明示地處理過這個題目。正如同時間與空間的本質以及人類意志的本質，康德回應有關哲學家與自然科學家爭論力的本質之成果。然而，康德並沒有在他的《批判》中，將力作為一個明示的主題，因而並沒有針對力的概念，提供一個明示的先驗說明。不過，我論證，吾人的確可以在康德哲學中尋獲一個有關力的先驗說明，而且這是一個經驗論與理性論說明的綜合，只不過在一處意想不到的地方：在《第三批判》中，有關合目的性原則的討論裡。

**關鍵詞：**康德、力、合目的性

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## Kant's Concept of Force: Empiricist or Rationalist?

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### Abstract

This paper explores Kant's account of force, a topic that was of central philosophical concern in his day, but which he does not explicitly address in any of his *Critiques*. Just as with the nature of space and time and the nature of the human will, the nature of force was under dispute by the philosophers and natural scientists to whose legacy Kant was responding. Yet, Kant does not make force an explicit topic of his *Critiques*, and thus provides no explicit transcendental account of force. Nevertheless, I will argue that one can indeed find in Kant a transcendental account of force, one that is a synthesis of empiricist and rationalist accounts, but in an unexpected place; the third *Critique*, in the discussion of the principle of purposiveness.

**Keywords:** Kant, force, purposiveness

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## **Kant's Concept of Force: Empiricist or Rationalist?**

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### **Introduction**

Kant's Copernican revolution in philosophy is often described as one that provides a "synthesis" of the traditional rationalist and empiricist views of his predecessors, and correctly so. In each of his *Critiques*, Kant shows how norms are not, as in the rationalist view, something external to us that exist in some noumenal world to which only God has perfect access. Nor are they something that, as the empiricists claim, have their basis in our contingent subjective natures. Rather, for Kant, norms have a transcendental origin, that is, they are grounded a priori in our own subjective faculties. As such, these norms attain the status of being both subjective and necessary. They are subjective, since they have their origin in the subject; however, they are also necessary and universal, since they are grounded in our transcendental faculties of understanding, sensibility, reason, and judgment. In his critical philosophy, Kant thus reconceives and thereby hopes to resolve the debates between the empiricists and the rationalists on

the central topics of philosophy; knowledge, moral obligation, judgments of beauty, and the nature of space and time, to name a few. His “transcendental” approach to these issues, which argues that the norms of judgment for these things are grounded in our own human cognitive faculties, enables him to avoid the problems that traditionally beset the rationalists--skepticism about the existence and bindingness of these norms, and the empiricists--questions concerning the possibility of any normativity at all, while maintaining what is right in their views.

In this paper, I am interested in exploring Kant's account of a topic that was of central philosophical concern in his day, but which he does not explicitly address in any of his *Critiques*. This is the concept of force. Just as with the nature of space and time and the nature of the human will, the nature of force was under dispute by the philosophers and natural scientists to whose legacy Kant was responding. Yet, Kant does not make force an explicit topic of his *Critiques*, and thus provides no explicit transcendental account of force. Nevertheless, I will argue that one can indeed find in Kant a transcendental account of force, one that is a synthesis of empiricist and rationalist accounts, but in an unexpected place; the third *Critique*, in the discussion of the principle of purposiveness.

It should be noted that I am using the terms “empiricist” and “rationalist” rather broadly here.<sup>1</sup> Empiricism and rationalism are typically epistemological terms, which give competing answers to the question of whether our knowledge is based on sense experience alone. However, in the context of 17<sup>th</sup> and 18<sup>th</sup> century philosophy, “empiricism” and

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<sup>1</sup> I am grateful to Rueylin Chen for prompting me to make this clarification.

“rationalism” pertain to more than just theories of knowledge, but to theories of morality and ontology as well. Empiricist philosophers, such as Hume and Hutcheson, argue that, like knowledge, moral obligation is also based on sense, albeit a moral sense. And rationalist philosophers, such as Leibniz and Wolff, argue to the contrary that moral obligation is based in reason. Empiricists also argue that the ontology of the world that we can know is a world of real objects that are presented to our senses. Rationalists argue that the objects of our knowledge are ideal and therefore can only be known by means of our reason. Kant's synthesis of empiricism and rationalism in his transcendental philosophy therefore does not just produce a new epistemology, but also a new moral theory and a new ontology. In this paper, I will argue that Kant's synthesis of empiricism and rationalism produces an ontology of force that is different from his predecessors.

My paper will proceed as follows; in section 1, I will briefly explain Kant's transcendental argument for space and time and show how it presents a “third way” that mediates between the “empiricist” view of Newton and the “rationalist” view of Leibniz. Although Kant's discussion of space and time is relevant to his discussion of force, this section will serve primarily as an example that will illustrate what I call the “transcendental twist,” which is Kant's way of mediating between empiricist and rationalist positions. In section 2, I will describe the debate between the rationalists and the empiricists over the nature of force as Kant understood it both in his pre-critical writings and in his Critical philosophy. In section 3, I will argue that one can find a transcendental account of force in the *Critique of Aesthetic Judgment*.

## 1. Kant vs. Newton and Leibniz on space and time.

In the *Critique of Pure Reason*, in the Elucidation of the *Transcendental Aesthetic*, Kant argues that space and time are “the pure forms of all sensible intuition.” They are the “two sources of cognition, from which different synthetic cognitions can be drawn a priori.” As conditions of sensibility, these sources of cognition determine their own boundaries, “namely that they apply to objects only so far as they are considered as appearances, but do not present things in themselves.” Kant argues against his opponents --both the Leibnizian idealist rationalist, and the Newtonian realist empiricist--who do not limit space and time to the appearances of things as follows;

Those... who assert the absolute reality of space and time, whether they assume it to be subsisting or only inhering, must themselves come into conflict with the principles of experience. For if they decide in favor of the first (which is generally the position of the mathematical investigators of nature), then they must assume two eternal and self-subsisting non-entities (space and time), which exist (yet without there being anything real) only in order to comprehend everything real within themselves. If they adopt the second position (as do some metaphysicians of nature) and hold space and time to be relations of appearances (next to or successive to one another) that are abstracted from experience though confusedly represented in this abstraction, then they must dispute the validity or at least apodictic certainty of *a priori* mathematical doctrines in regard to real things (e.g. in space)... on this view the *a priori* concepts of space and time are only creatures of the imagination (A39/B56).<sup>2</sup>

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<sup>2</sup> All references to Kant's works are given by volume and page number of the *Akademie* edition, except for citations of the *Critique of Pure Reason*, which utilize the customary format of

By the “mathematical investigators of nature,” Kant has Newton in mind. Newton's view of space<sup>3</sup> is that it is something real that exists in its own right. According to Newton, it is by virtue of being “in” space that objects take on spatial properties. Yet, as Leibniz points out in his correspondence with Clark, if space is absolute in this way, then there is no way for this space to give the objects that are in it any distinctive spatial properties; for example, how do we know up from down? How do we know if one thing is twice as long as another? Space, as something that exists in its own right, aside from the objects that are in it, ends up not having any of the properties that we attribute to space.<sup>4</sup> According to Leibniz, space is not something that objects depend on for their spatial properties, but is instead the relation between monads. Each monad is created with its own spatial (and temporal) predicates that indicate its spatial (and temporal) relation to other monads. For Leibniz, space and time are ideal since they just represent the ordering of the perceptions of the monads. These perceptions are themselves ideal--monads have no real relation to anything outside of them, no “windows” through which things enter and leave.<sup>5</sup> Our perceptions are just perceptions, albeit vague ones, of the thought of God.

From the perspective of Kant's own position, that of transcendental idealism, both Leibniz and Newton are wrong, since they see space and time as something in itself, that is, something that does not depend on a relation to

<sup>1</sup> ‘A’ and/or ‘B’ to refer to the first and/or second edition: Kant, Immanuel. *Gesammelte Schriften*, ed. Königlich Preußischen Akademie der Wissenschaften. Berlin: Reimer, 1908.

<sup>3</sup> For the sake of simplicity (of both prose and philosophy), I will refer just to space in what follows.

<sup>4</sup> See the *Leibniz-Clarke Correspondence*, ed., H.G. Alexander (Manchester: Manchester University Press, 1956), p. 26.

<sup>5</sup> Leibniz, *Monadology* in G. W. Leibniz, *Discourse on Metaphysics and other Essays*, Trans by R. Ariew and D. Garber and (Indianapolis: Hackett, 1991) p. 68.

our human cognitive faculties for their existence--either as something real in itself, or absolute, as in Newton, or as something ideal in itself as in Leibniz. According to Kant's own transcendental idealism, "time and space are only sensible forms of our intuition, but not determinations given for themselves or conditions of objects as things in themselves" (A369). By considering space and time as sensible forms of our intuition, Kant is able to avoid what is wrong with both Newton's and Leibniz's views. However, he also incorporates what is right in each of their views and thus creates a synthesis of their positions. If space and time are pure forms of sensible intuition, then, as with Newton, it is still possible to say that objects are "in" space, that is, that they get their spatial properties by virtue of appearing in a certain "form." However, instead of being an absolute "thing in itself," space is instead the form of our sensible intuition. Likewise, with Leibniz, Kant is able to say that space and time are mind dependent, or ideal. Yet, for Kant, space and time are not ideal in Leibniz's sense as what is grounded in the mind of God. Instead, they are transcendently ideal, they are grounded in the nature of our own sensibility as forms of intuition.

Kant's transcendently ideal view of space and time thus takes from Newton what I will call the empirical content of his view, the distinctive "form" that space and time have. Although it might seem unusual to call Newton's view of space "empiricist," since his view of space is of something absolute, still this view is part of Newton's overall empiricist account of natural laws. He thinks such a view of space is necessary in order to

account for the empirical phenomena.<sup>6</sup> For Kant, as for Newton, space is what gives a spatial form to objects and is the basis of their spatial coordinates. Space appears to Kant as it does to Newton, as something in which geometrical shapes can be constructed. From Leibniz, Kant takes what I will call the metaphysical status of space and time. For both Kant and Leibniz, space is ideal--although for Kant it is transcendently ideal and has its origin in the human mode of cognition, whereas for Leibniz it is really ideal, spatial relations are ultimately known by the mind of God.

What I want to highlight from this discussion is a basic transcendental strategy of mediating between an empiricist and a rationalist position that can be found in all of Kant's *Critical* writings. I will call this strategy the "transcendental twist." Kant takes from the empiricists the content of their view and adds to this the normative metaphysics of the rationalists, however, in an altered form. What are for the rationalists objects of the pure intellect, are for Kant transcendental forms of our own cognition and are hence limited only to the realm of appearances. What, for the empiricist position are descriptions of the world based merely on our sense perceptions, such as the view that objects are in a space, are for Kant judgments of experience that are grounded in our transcendental faculties of cognition. We can see this pattern in many of Kant's arguments. For example, Kant agrees with Hume that our experience appears as if it is causally connected. However, he replaces Hume's empirical justification for this appearance, which is human custom and habit, with a stronger justification based on the necessary

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<sup>6</sup> See H.G. Alexander, Introduction to the *Leibniz-Clarke Correspondence*, (Manchester: Manchester University Press, 1956), pp. xxxiv-xxxvii.

functions of concepts. However, for Kant, these concepts are not in the mind of God, as they are for Leibniz, but are a priori concepts of human cognition. It is the same with his moral theory. Kant takes from the empirical sentimentalist moral philosophers the view that moral obligation must involve some sort of subjective relation to the action, which serves as a motivation to do it. From the rationalist moral philosophers, Kant takes the view that moral obligation must involve necessity, usually based in a rational intuition.<sup>7</sup> Kant then argues that the source of this necessity is not in something outside of the subject, such as in the divine will, but in our own pure practical reason. He thus combines these two views to argue that we are necessarily motivated to act morally, but this is based on our own subjective faculty of pure practical reason. What Kant achieves by this “transcendental twist” strategy is, indeed, the possibility of synthetic a priori judgments. He is able to make necessary judgments about the empirical world, since these judgments are based in our own transcendental faculties. In what follows, I want to show how Kant provides such a “transcendental twist” to the debate between the empiricist and the rationalist view of force.

## 2. Empiricist and Rationalist Views of Force

### 2.1. The vis viva controversy

Kant’s first essay, written in 1747, concerns the debate between Leibniz and Descartes over the nature of force, the so-called “vis viva” controversy.

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<sup>7</sup> See Korsgaard’s discussion in “Analysis of Obligation” in *Creating the Kingdom of Ends*. (Cambridge: Cambridge University Press, 1996).

In his “*Brevis demonstratio*,” Leibniz argues against Descartes' view that the quantity of motion of moving bodies is the same as the quantity of moving force acquired by these bodies. According to Leibniz, what is conserved is moving force, or *vis viva*, whose measure is  $mv^2$ , and not Descartes' quantity of motion, whose measure is  $mv$ . By making this distinction between motion and moving force, Leibniz is also arguing against Descartes' definition of a body as mere extension and his claim that matter consists only of geometric properties. For Leibniz, force is the essential element of matter and is intrinsic to it, it is not just the measure of the product of the mass and velocity of the body. For motion cannot be reduced to the mathematical properties of bodies, but includes what he calls “metaphysical considerations” as well.

What Leibniz means by “metaphysical considerations” are the formal principles that are the basis of teleological explanations. Whereas mechanistic explanations refer to general laws that organize nature as a whole, teleological explanations refer to the form or end of a particular thing. What makes a teleological explanation *metaphysical* is that it refers to a *telos* towards which something strives, which cannot be known through natural scientific explanation, but is intelligible only to the intellect. According to Leibniz, we must add to material mass “a certain superior and, so to speak, formal principle.”<sup>8</sup> This formal principle is in fact force. In Leibniz's metaphysics, the primitive force is the entelechy of a substance or monad. It

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<sup>8</sup> Leibniz, *Specimen Dynamicum*, in R. Ariew and D. Garber ed. and trans. *Philosophical Essays* (Indianapolis: Hackett, 1989), p. 125.

is what Leibniz calls its “soul or substantial form,”<sup>9</sup> and is what drives the monad to attain its end. Force, for Leibniz is thus not a physical entity, but a metaphysical animating form by which something strives towards its end. Since Descartes sharply separates what is material from what is spiritual, and since, for him, “force” is more closely associated with spiritual rather than material activity,<sup>10</sup> force cannot be something that is intrinsic to matter. Descartes’ project was to make the physical world subject to geometry. Like the empiricists of the 17th century, Descartes considers the properties of matter to be just extension and motion. Although, for Descartes, in contrast to the empiricists, these properties are not known through the senses, but by the intellect, they are still the same properties, namely motion and extension. Indeed, although Descartes is not typically understood to be an empiricist, this debate between Leibniz and Descartes has the same general structure as the other debates between rationalism and empiricism for which Kant’s transcendental idealism provided a synthesis. On the one hand, there is the metaphysical position, represented by Leibniz, which argues for a primitive force, the entelechy of a monad, which is ideal rather than real. On the other hand, there is the mathematical position of Descartes, who argues that force, as a motive force, is itself a property of extended bodies, and can be subjected to mathematical quantification. Although, for Descartes, motive force is known by the intellect rather than by the senses, from Kant’s point of view, the ontology that Descartes attributes to force is an empiricist one, since it is measurable in the same way as are other empirical objects.

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<sup>9</sup> Ibid., 119.

<sup>10</sup> Max Jammer, *Concepts of Force* (New York: Dover Press, 1999) p. 103

We can thus see in Kant's first essay an early example of his strategy of "synthesis." Here, he attempts to reconcile Leibniz's "living force" and Descartes' "dead force" by actually mediating between them, that is, by finding a common ground. As Kant sees it, the difference between "living force" and "dead force" is that the former is "internal" to the body and is ideal, and the latter is "external" and is "real." For Kant, living force does not really have to do with motion at all, but rather with what is internal to a body. In fact, if one considers force to be just what *maintains* a body in motion, then Leibniz is wrong; the measure of this motion is not  $mv^2$ , but  $mv$ , as Descartes had claimed. This is because a body can be maintained in motion by a continuous pushing by a "dead force" and an immediate end to motion can occur when the pushing has stopped. A living force, on the other hand, is one that preserves itself in a body and continues into infinity if it faces no opposition, like a ball shot from a pistol. A living force is thus one that has an "inner source" which is an everlasting force (1: 28), whereas a dead force is a force from outside a body. According to Kant, a living force differs from a dead force in that it cannot be subject to mathematical measurement. Kant writes, "mathematics does not allow that its bodies have a force that is not entirely produced from that which is the external cause of its movement" (1: 149). Indeed, one of Kant's aims in this essay is to help Leibniz by showing that there is in fact a conception of force that cannot be subject to mathematics. As Leibniz had described it, as a force that maintains a body in motion, such a property *can* be mathematically defined.

By conceiving of the Leibnizian force as what is “inner” to an object and as what is not subject to mathematical measurement, and the Cartesian force as a force carried through by an “external” power, Kant is able to show how there need not be a conflict between the two kinds of forces. But he does more than this, he shows how the two conceptions of force are *connected*, and thus locates a “third thing” that mediates between the two. He does this by introducing the concept of what he calls the “intension” of a body. Kant writes;

Force is rightly estimated by the obstacles that break and eliminate it in the body. This shows that a body would have no force whatsoever if there were not in it a striving for preserving [its] state in itself—the [very] state that obstacles are supposed to eliminate. For if this was not the case, then whatever serves to break obstacles would be like zero. Motion is the outward phenomenon of force, but the striving for preserving this motion is the basis of activity, and velocity indicates how this striving must be multiplied to get the whole force. For this purpose, we shall call the striving “intension”; hence force equals the product of velocity and intension. (1: 141)

According to Kant, the “intension” of a body, its “striving to preserve its state in itself,” acts like a spring, which, when it has external pressure applied to it from the outside, gradually collects this pressure until it can ultimately spring forward with a force of its own which is its living force. The intension is thus what transforms the pressure from an external dead force into the living force by which a body can oppose obstacles. According to

Kant, it is really this intension, or striving, that cannot be measured mathematically. As an internal capacity of a body, it does not exist in space and time.

In this early pre-critical work, we can thus see Kant trying to provide a synthesis of the views of Descartes and Leibniz. Of course, here there is no “transcendental twist.” Kant argues in a straightforward way that there must be a third, mediating, function in a body in order for Descartes' dead force to become Leibniz's living force. This “third thing” however is on the side of metaphysics. According to Kant, the intension is really what Leibniz should have emphasized if he wanted to argue that force was a qualitative property of a body and not something mathematically quantifiable. Perhaps due to the fact that the *vis viva* controversy ceased to be of interest to philosophers of nature by the 1750's (in fact D'Alembert's solution to the problem was pretty much accepted by the time that Kant wrote his own essay), there are practically no references to living force or intension in Kant's subsequent writings. However, Kant was still interested in the nature of force in his critical philosophy, and I believe his concept of intension still played a role in his thinking about it.

## 2.2. The Critical philosophy and the Metaphysical Foundations of Natural Science

In the discussions of force in his Critical philosophy, Kant is not explicit that he is resolving a debate between empiricists and rationalists. In fact, regarding the debate between Leibniz and the Newtonian, Clarke, over action at a distance, Kant unequivocally sides with Clarke. Nevertheless, the

account of force that Kant gives in his *Metaphysical Foundations of Natural Science* (*MFNS*), which is where his most sustained discussion of force occurs, involves a subtle negotiation between empiricist and rationalist views, and, I will argue, ultimately requires a “transcendental twist.” As the title promises, the *Metaphysical Foundations of Natural Science* (1786) is Kant's attempt to provide a metaphysical foundation for natural science. For Kant, natural science means Newtonian physics, and the metaphysical foundation to Newton's science is itself grounded in the synthetic a priori principles of the understanding that Kant argued for in the first Critique. In the *MFNS*, Kant aims to show that the Newtonian concept of matter is grounded in these principles.

I will focus on the second chapter of the *MFNS*, “the Metaphysical Foundations of Dynamics,” where Kant argues that matter is made up of attractive and repulsive forces. In this chapter, Kant's relationship to Newton is ambiguous. Kant argues against Newton and with Leibniz that force is prior to extension and is thus beyond mathematical measurement. However, Kant agrees with Newton that force consists of attractive and repulsive forces that are in real interaction, and thus argues against Leibniz, for whom force is the “soul or substantial form,” of a monad. We will see, therefore, that Kant takes from Leibniz the rationalist metaphysical status of the object being considered and that he takes from Newton the empirical “content” of force--indicating that Kant's approach to the concept of force qualifies it for a “transcendental twist.”

### 2.2.1. Kant and Leibniz

In the *MFNS*, Kant agrees with Leibniz that extension is not primitive. He writes,

Proposition 2

Matter fills a space through the repulsive forces of all of its parts, that is, though an expansive force of its own, having a determinate degree, such that smaller or larger degrees can be thought to infinity. (4:499)

Kant's reasons for this view of extension, however, are not Leibniz's. For Leibniz, force is prior to extension because primitive force is the entelechy of the monad. It is what determines what spatial predicates it is to have. As the entelechy of the monad, force is in fact prior to everything, including the phenomenon of extension. However, for Leibniz, this priority is logical, not causal, as it is for Kant. For Kant, force is prior to extension because force is what causes matter to fill a space. For Kant, the origin of force must be different than it is for Leibniz, since Kant does not think that force originates in the monad. Yet, even though Kant's view of force is not Leibniz's, it is still metaphysical. Kant agrees with Leibniz that force cannot be subject to mathematical laws. For Kant, as for Leibniz, there is a "Metaphysical Foundation of Natural Science." The difference between Kant and Leibniz is just that they have different views of metaphysics. For Kant, the metaphysics that is to ground physics is not based in the reason of God, as it is for Leibniz, but on our human transcendental faculties of cognition. From the above, we see that, as in his discussion of space and time, Kant takes Leibniz's metaphysical view of force, but does away with his rationalist

monadology. If the pattern of Kant's "transcendental twist" were to hold in the case of force, we would now expect Kant to argue that force has a transcendental status and has its origin in a human cognitive faculty. Before investigating this, let us see how Kant responds to the empiricist view of force.

### 2.2.2 Kant and Newton

With Newton, Kant agrees that force is real and that attractive and repulsive forces really interact with each other. Kant also agrees that the effects of force, such as impenetrability, can be sensed and hence are empirical. In the *Critique of Pure Reason*, Kant contrasts Newton's view with Leibniz's as follows;

The inner and the outer. In an object of the pure understanding only that is internal that has no relation (as far as the existence is concerned) to anything that is different from it. The inner determinations of a *substantia phaenomenon* in space, on the contrary, are nothing but relations, and it is itself entirely a sum of mere relations. We know substance in space only through forces that are efficacious in it, whether in drawing others to it (attraction) or in preventing penetration of it (repulsion and impenetrability); we are not acquainted with other properties constituting the concept of the substance that appears in space and which we call matter. As an object of the pure understanding, on the contrary, every substance must have inner determinations and forces that pertain to its inner reality...thus because he represented them as noumena, taking away in thought everything that might signify outer relation...Leibniz made out of all substances, even the

constituents of matter, simple subjects gifted with the powers of representation. In a word, monads. (A265-B321)

Kant's point here is that it is only by means of attractive and repulsive force that we are able to have any sensible relation to objects in space. And, it is Kant's view that we do have such a sensible relation to objects. If, as in Leibniz's view, force is an inner, noumenal, property of the monad, then matter would not appear to us as something in space, and, according to Kant, this is how it does appear. Thus, Kant agrees with Newton that force is what makes possible real relations between material substances. To this, however, Kant adds his own point, which is that it is by means of attractive and repulsive forces that substances become objects of sensible appearance for us.

Kant disagrees with Newton, however, over whether matter is impenetrable. According to Newton, matter consists of hard impenetrable atoms and empty space. For Newton, force is something that exists *between* these atoms. But Kant argues that if we take this "mathematical-mechanical" approach to explaining the "variety of matter," then "it must take an empty concept (of absolute impenetrability) as basis; and second, it must give up all forces *inherent* in matter" (4: 525). On Kant's view, attributing "impenetrability" to matter does not really explain how it is that pieces of matter are not able to penetrate one another. Absolute impenetrability is "in fact nothing more nor less than an occult quality" (4:502). A theory that attributes attractive and repulsive forces to matter by which they fill space dynamically, on the other hand, can explain that pieces of matter can resist one another by means of a repulsive force.

### 2.2.3. Conclusion

We can now say that, from Newton, Kant takes the “empirical content” of his view that the force of matter includes both attractive and repulsive forces, which are in real interaction with each other. However, for Kant, force is also what is the *basis* of the matter's capacity to take up space and not just its effect.<sup>11</sup> From Leibniz, Kant thus takes the metaphysical position that force is prior to extension. For Kant, force is the condition of the possibility of matter being something to which we can attribute sensible predicates. It now seems that what Kant's account here needs in order to be a coherent synthesis of these views is a “transcendental twist.” Given that Kant endorses the metaphysical-dynamical status that Leibniz gives to force as something that is prior to extension, but does not endorse Leibniz's own rationalistic metaphysics, and moreover, given that Kant thinks that force is a necessary condition for the possibility of our attributing sensible predicates to objects, one would expect Kant to argue for an a priori form of force in a way similar to his arguments for space and time. Indeed, like space and time, which are necessary for an object to be an object of appearance for us, the degrees of the intensity of a force are also necessary for it to be a sensible

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<sup>11</sup> See Watkins' discussion of Kant's relation to both Leibniz and Newton in "Kant on Extension and force: Critical Appropriations of Leibniz and Newton," in *Between Leibniz, Newton and Kant: Philosophy and Science in the Eighteenth Century*. Ed. Wolfgang Léfevre (Dordrecht, Kluwer Academic Publishers, 2002), p. 119. Watkins explains that Kant attempts to resolve the dilemma between Leibniz's "cryptic" entelechy, and Newton's vacuous explanation of forces merely by "emphasizing the core notion of a force that he has accepted from Leibniz, namely that force is a causal activity of a substance that explains a change of state" and by "characterizing forces in terms of their effects," as does Newton (p. 124). I am in general agreement with Watkins picture here, except that on my view the "core notion" of force that Kant takes from Leibniz is indeed that of a striving or entelechy. Much of my article is indebted to Watkins' discussion.

object for us.<sup>12</sup> Although Kant does not say this explicitly, it is impossible to think of a possible object of experience without also thinking that it has sensible properties in general.

One should note in this context that the chapter on the Metaphysical Foundations of Dynamics corresponds to the categories listed under the heading of quality in the *Critique of Pure Reason*; reality, negation and limitation. These categories are what make possible affirmative, negative and infinite judgments. For Kant, a “quality” is the “reality” of a thing. In scholastic terminology, it is what can be predicated of an object, that is, affirmed or denied of it. For Kant, these predicates are sensible predicates. In the “Anticipations of Perception,” which is Kant’s principle of the pure understanding that corresponds to the categories of quality, he writes, “its principle is: In all appearances the real, which is an object of the sensation, as intensive magnitude, i.e. degree” (B207/A165). It is this principle that governs Kant's discussion of matter in his chapter on dynamics in the MFNS. Thus, in his “general note” to the dynamics chapter of the MFNS, Kant writes,

if we look back over all of our discussion of the subject, we will notice that we have therein considered the following: *first*, the real in space (otherwise called the solid), in the filling of space through *repulsive force*; *second*, that which in relation to the first, as the proper object of our outer perception is *negative*, namely, *attractive force*, whereby, for its own part, all space would be penetrated, and

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<sup>12</sup> See Anneliese Maier, *Kants Qualitätskategorien*, (Pan-Verlag Kurt Metzner, 1930), p. 66.

thus the solid would be completely destroyed; third, the limitation of the first force by the second, and the determination of the degree of filling of a space that rests on this. Hence the *quality* of matter, under the headings of reality, negation and limitation, has been treated completely, so far as pertains to metaphysical dynamics (4:523)

Here we see that, for Kant, the “filling of space through repulsive force” is the “proper object of outer perception.” The quality of matter, which is what makes it an object of sensible perception to us, is based on the relationship between attractive and repulsive forces and the degree by which they take up space. In this way, force therefore serves as necessary condition for the possibility of sensory experience. Yet, in the *Critique of Pure Reason*, Kant gives no explicit transcendental account of force. The one definition of force can be found in §10 of the Analytic of Concepts, where Kant lists force as a “predicable” under the category of causality. By “predicable” Kant means those predicates, which can be predicated of a cause. According to Kant, a cause can be a “force,” or an “action” or a “passion.” Although Kant says that such predicables are pure but derivative concepts of the understanding, and thus he attributes to force a priori status, he does not say what exactly force is. That is, he does not make explicit what are the sensible conditions under which the concept of force could be applied. Although the category of cause is a condition for the possibility of the knowledge that for every event there is a cause, it does not follow that the concept of force, which is what can be predicated of a cause, is what makes

possible *knowledge* of force. As we shall see, this concept can play a different kind of role in cognition. Nowhere does Kant say that such knowledge is possible. We will thus have to investigate exactly what it is to which the concept of force refers.

In the MFNS, Kant's comments on the status of force within his philosophical system are obscure. He writes; "but who pretends to comprehend the possibility of the fundamental forces? ...We can certainly judge *a priori* about the connection and consequences of these forces, whatever relations among them one can think without contradiction, but cannot yet presuppose one of them as actual" (4:524). In other words, such forces remain merely hypothetical; although we can think about their relations *a priori*, we cannot say with certainty whether they can be an actual part of our experience. Although we can say that in principle it is necessary for sensation, we cannot say whether we can actually sense force. According to Kant, the reason why we cannot presuppose any forces as actual is that they cannot be constructed in intuition. He writes that if matter is "transformed into fundamental forces... we lack all means for constructing this concept of matter, and presenting what we thought universally as possible in intuition" (4:525). What Kant means here by the "construction of a concept" is the form of mathematical cognition by which we exhibit a geometrical figure or an arithmetical formula *a priori* in intuition. For example, the concept of a triangle can be exhibited in pure space according to the rule for constructing a triangle. The reason why fundamental forces cannot be constructed in intuition is precisely because,

unlike geometrical shapes and arithmetic numbers, they are not objects of mathematics.

Force is not an object of mathematics for Kant because it is an intensive magnitude. It is measured in terms of degree. This is in contrast to space and time, which are extensive magnitudes and are measured in terms of units. Force cannot be constructed in intuition, since there is no form of intuition for it to be intuited in. In the Anticipations of Perception, Kant criticizes those mathematical and mechanical natural philosophers who assume that the real in space “is everywhere one and the same and can be differentiated only according to its extensive magnitude, i.e. amount” (A173/B215). According to Kant, it is just as possible that matter is differentiated by degree and is an intensive magnitude. Indeed, “the nature of our perceptions makes an explanation of this sort possible” (A174/B216). Since Kant considers force to be what is *necessary* to matter's taking up space by degree, it seems that what Kant needs in order for his comments on force to be coherent is a transcendental form of force, one that would be a form for the sensible appearance of the intensive magnitudes of force. In what follows, I will argue that such a transcendental form can be found *not* in Kant's discussion of the possibility of knowledge in *Critique of Pure Reason*, but instead in his discussion of the possibility of reflective judgments of value in his *Critique of the Power of Judgment*.

### 3. The *Critique of the Power of Judgment*

In the *Critique of the Power of Judgment*, Kant argues for a transcendental principle of reflective judgment, which he calls the “principle

of the formal purposiveness of nature.” On my view, this principle, and the form of purposiveness that it makes possible, represent Kant's transcendental account of force. By understanding the principle of purposiveness as Kant's transcendental synthesis of the empiricist and rationalist views of force, we can see how Kant transforms Leibniz's metaphysical account of a primitive force into a form of our own a priori cognition. What, for Leibniz, is the primitive force of a monad, becomes, in the *Critique of the Power of Judgment*, the transcendental form of our faculty of judgment. Moreover, Kant's principle of purposiveness also transforms Newton's empirical account of attractive and repulsive forces into a transcendental account of these forces by which they are shown to be necessary for cognition. It should be noted that, as with Kant's account of the “transcendental ideality” of space and time in the first *Critique*, any account of force as grounded in a transcendental form and hence as transcendently ideal will not give us the thing in itself, but only that thing as it is conditioned by our a priori form of cognition. In this way, the forces that we consider in our reflective judgment cannot be things-in-themselves. Instead, they are the form of the way that we consider objects in reflection. That is, we consider them as purposive, as objects that are striving to be objects of cognition for us. And here we will also see how Kant's early concept of intension, the striving of a force, plays a role in his discussion of reflective judgment.

In the *Critique of the Power of Judgment*, Kant defines reflective judgment as the faculty for finding the universal for a given particular and thus as what makes concepts possible. In the Introduction to the third

*Critique*, he explains the difference between reflective and determinative judgment as follows;

The power of judgment in general is the faculty for thinking the particular as contained under the universal. If the universal (the rule, the principle, the law) is given, then the power of judgment, which subsumes the particular under it (even when, as a transcendental power of judgment, it provides the conditions *a priori* in accordance with which alone anything can be subsumed under that universal), is determining. If, however, only the particular is given, for which the universal is to be found, then the power of judgment is merely reflecting. (5: 179)

Kant calls the activity of trying to find a universal for a given particular *merely* reflecting precisely because it is not determinative; it just reflects upon, or considers, the particular with regard to the possibility of finding for it a universal rule, principle or law. This is in contrast to the determinative power of judgment, which subsumes the particular under the universal, and hence determines it.

In order for reflection to be possible, it must at least be thought that it is possible to find such a general concept for given particulars, under which they can be subsumed. Without this hope, there would be no reason to reflect. The principle of reflection is thus what gives us this “expectation.” Kant writes,

The principle of reflection on given objects of nature is that for all

things in nature empirically determinate concepts can be found, which is to say the same as that in all of its products one can always presuppose a form that is possible for general laws cognizable by us. For if we could not presuppose this and did not ground our treatment of empirical representations on this principle, then all reflection would become arbitrary and blind, and hence would be undertaken without any well grounded expectation of its agreement with nature. (20:212)

The principle of reflection thus does not say how nature really is. Instead, it gives the norm that guides the activity of reflection and makes it possible; the principle says that we ought to presuppose that products of nature conform to a form that is cognizable for us. Kant states that this principle is “heautonomous,” rather than merely autonomous, since not only does it originate in the faculty of reflection itself (and hence is autonomous), but it legislates only over its *own* activity of reflection (it is *he*-autonomous). The principle of reflection is thus directed to the subject and not to an object. Kant calls the principle of reflective judgment “the principle of the formal purposiveness of nature” (5:180) because to judge an object as something for which a concept can be found is to judge it as purposive. For Kant, something is purposive when its possibility is based on the concept of an end. Kant defines an “end” as “the concept of an object insofar as it at the same time contains the ground of the reality of the object” (5:180). An end is that concept by which the reality of an object is possible. Seeing something as purposive thus means that we see it as grounded in some concept, and this

makes it possible to attribute predicates of judgment about it. It means seeing it as if there is a way that it is meant to be and thus as something that it is subsumable under a concept.

This principle of purposiveness is thus a teleological principle, since it says that we must judge objects as if they had an end. Here we can see that Kant takes what was for Leibniz the entelechy of the monad, its primitive force, which drives it to achieve its end, and makes it a principle of our own cognitive activity--a condition for the possibility of our thinking of objects according to concepts. Rather than being in the monad or in the thing in itself, purposiveness is in *us*. It is that form by which we see objects in nature as being purposive, even though we can never say whether they are really purposive in themselves. This form functions similarly to the formal intuitions of space and time, which are the conditions of the possibility of objects appearing to us as spatial and temporal. It is that form by which objects appear to us as purposive. Unlike space and time, however, this form is not a form of intuition. It is also not a concept. Instead, it is the form of our own mental activity of reflection, by which the mind considers things as if they had an end. Thus, not only is it a form for the way we regard objects, but, which is in fact to say the same thing, it is also a form of our *own* mental activity. When we reflect, our faculties of cognition are themselves purposive, since, by seeing objects as if they had an end, our faculties are striving towards their own end, which is that of cognition.

Moreover, this form by which we see nature as purposive is a form of intensive magnitudes, rather than extensive magnitudes, as are space and time. What this form makes possible is not the objective determination of a

thing, but the comparison in reflection of different things in terms of their degrees of similarity and difference in order to come up with a concept in the first place. A form of extensive magnitude, by contrast, makes possible the counting of the units of a thing and thus presupposes that they are already determinate. We can see that Kant considers the form of purposiveness as an intensive form in his discussion of the system of nature. According to Kant, the principle of purposiveness enables us to consider nature as organized as a system, and thus makes possible scientific inquiry that can find order in the diversity of the empirical laws of nature. This systematic form of nature is in fact an intensive form. It is one in which the parts are related to each other by degree in order ultimately to form an organized whole. In the Appendix to the Transcendental Dialectic of the first *Critique*, Kant's description of systematic unity provides a good illustration of the system considered as an intensive form. In a systematic unity, he explains, it is possible to regard every species as related to the "highest genus" by degree (A659/B687).

there is no vacuum of forms (*non datur vacuum formarum*) i.e. there are no different original and primary genera, which would be, as it were, isolated and separated from one another (by an empty intervening space), but rather all the manifold genera are only partitionings of a single supreme and universal genus; and from this principle its immediate consequence: *datur continuum formarum*, i.e. all varieties of species are bound to one another and permit no transition to one another by a leap, but only through every smaller

degree of distinction, so that from each one can reach another; in a word, there are no species or subspecies that are proximate (in the concept of reason), but intervening species are always possible...” (A659/B687)

This view of the relationship between different species resembles Kant's argument in the *MFNS* against the atomistic theory of matter and for the dynamical view, in which there is no empty space between pieces of matter. In fact, Kant also notes that systematic unity “concerns not merely the things, but even more the mere properties and forces of things” (A662/B691). It is by means of the regulative principle of systematic unity that we are able to say that the movements of the planets and the comets and the world system in which they move “is connected through one and the same moving force” (A663/B691). Here we see that the medium through which the properties of things are connected in a system is force. Thus, in the Third *Critique*, it is Kant's principle of purposiveness that makes it possible for us to say that the world system is connected by a moving force.

We can now see how Kant's “transcendental twist” concerning force is able to provide a ground for Newton's attractive and repulsive forces. According to Kant, by means of the principle of purposiveness, we necessarily think of the world as organized systematically in order for us to be able to investigate the world as natural scientists. And to think of the world as organized this way is just to think of it as containing the Newtonian forces of attraction and repulsion that Kant agrees best describes our empirical experience of the world. Force, for Kant is thus the

transcendental form of cognition by which we are able to consider the world as if it were organized for the sake of being cognized by us--and this requires seeing it as a systematic unity connected through a Newtonian moving force. It might seem strange to say that force is really a "form of cognition." However, once we understand that force itself is a form, that of purposiveness, we can see how it can be a transcendental form of cognition. Indeed, it should be no stranger to think of force this way than it is to think of space and time as forms of cognition. Just as space and time are "subjective conditions of sensibility" (A26/B42), force is a subjective condition for the possibility of being able to reflect and ultimately to come up with concepts. And, just as space and time, as "forms of intuition" make possible the intuitions of particular spaces and times, so does force, as the form of purposiveness make possible reflective judgment on the Newtonian forces that unify nature. Here it is worth noting that Kant calls *the Critique of the Power of Judgment*, *Der Critique der Urteilkraft* (force of judgment) rather than *Critique der Urteilsvermogen* (faculty of judgment). This transcendental account of force constitutes a revolution in the way that force was typically conceived by Kant's predecessors, who saw force as something existing apart from us as either in nature or in the mind of God. For Kant, however, the origin of force is in us. This is not to say that we put actual forces into the world. But it is to say that force, now as a transcendental form, is what makes it possible for us to consider the world as something in which objects are purposive and are systematically ordered.

## Conclusion

To conclude, I would like to emphasize that what I am calling Kant's form of force, which is the principle of the formal purposiveness of nature, is the principle of our faculty of *reflective* judgment. As such, it is a principle that concerns not the objective determination of the things in nature that we judge, but rather the *way* that we are to judge these things. On my interpretation, this principle says that the way we ought to judge something is as if it has an end towards which it is directed, and also that we judge nature itself as a system and hence as ordered by Newtonian moving forces. On this account, force is indeed not a thing in itself, nor an object of empirical knowledge. It can be justified neither by empiricism nor rationalism. Instead it is a form of the way that we must consider the world if it is ultimately to be knowable to us and is thus transcendently ideal. In contemporary language, it can be said that for Kant force is a theoretical entity, although it is necessary to *any* theory of nature that we might have.<sup>13</sup>

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<sup>13</sup> I would like to thank the audience at National Taiwan University, where this paper was originally presented, Jeu-Jeng Yuann for his hospitality while I was a visiting scholar at National Taiwan University, and the anonymous reviewers of this article.